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ARMED DRONES FOR THE ROYAL CANADIAN NAVY

Commander Nicholas Manley

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Exercise *Solo Flight*

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OVERVIEW

Rapid technological development and proliferation of drones and armed drone technology around the world has the potential to dramatically influence how the Royal Canadian Navy (RCN) conducts operations around the world. Could and should armed drones be in the future of the Royal Canadian Navy? This paper will argue that the RCN should be investing now in both offensive and defensive drone technology for all of its platforms.

Given the trends in adoption of artificial intelligence, the decrease in the effective battlespace in littoral environments, and the proliferation of armed drone technology around the world, it is a necessity that the RCN accelerates development and improves execution of the many operational use cases. The reason for acquiring armed drones is not solely for the offensive capability to launch precision strikes at designated targets in far away countries. It also includes the ability to strike at naval targets, both at the surface and below the surface, as well as add teeth to the maritime interdiction capabilities so often used to enforce embargos or sanctions.

The proliferation of armed drone technology is not only limited to that of our allies and large potential adversaries such as Russia or China. Non-state organizations and proxy groups have adopted the use to further their goals and are using the technology with increasing lethality and range. Therefore, the RCN must also consider new defensive technologies and operational doctrine to protect assets and assure operational capacity in new threat environments.

Whether it is a maritime surveillance operation to enforce sanctions against North Korea (Operation NEON), or operations against drug smuggling conducted by criminal and terrorist organizations in the Indian Ocean (Operation ARTEMIS), armed drones will give the RCN the

capability to force multiply effect in a cost effective and immediate manner through an integrated capability to detect and engage beyond the current reach.

STRATEGIC RATIONALE

Any discussion of new capabilities begins with the current national defense policy. "*Strong, Secure, Engaged*[1]" (SSE) calls for investments in remotely piloted systems for both the RCN and for the Royal Canadian Air Force (RCAF). SSE also notes that the rapid development of technology has the potential for "*increasing levels of autonomy in remotely piloted systems*". As well, the proposed investment includes an *armed* aerial system capable of both surveillance and precision weapons strikes, as well as research and development in remote piloting capabilities at land, sea, and air domains.

The RCN Strategic Plan 2017-2022[2], written in concert with SSE, reiterates the overall global context of rapidly changing and proliferating technology, and how naval platforms must be adaptable and flexible to operate in a wide variety of hostile environments against traditional and hybrid threats from state and non-state actors. The concept of a "Blue Water Navy" remains the core underlying tenant of the RCN's capabilities; the ability to send and sustain a Naval Task Group to any location and the world to execute the will of the Government of Canada.

The ability to obtain command of the sea, whether on our own or in coalition task groups, is the *raison d'être* of the RCN. Many definitions exist for the naval functions required to obtain command of the sea; the USN defines five essential sea power functions as operational access, deterrence, sea control, power projection, and maritime security operations[3]. But these essentially break down into two core functions: sea control and power projection. Navies require

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[1] Canada, Department of National Defence, "*Strong, Secure, Engaged*", 2017
[2] Canada, Department of National Defence, "*RCN Strategic Plan 2017-2022*", 2017
[3] US Department of Defense, "Joint Maritime Operations", 8 June 2018, pages I3, I4

the ability to control the sea lanes, and by extension deny it to others. Power projection is the ability to reach out both within and even beyond the controlled sea regions and inflict damage on air, sea, and land-based targets. Drones have the capability to dramatically improve the RCN's capabilities in all of these areas, while the threat of armed hostile drones have the potential to reduce the RCN's ability to gain control of certain areas by denying access.

Drones have an increasing presence in the world's modern battlefields. The technology has been developed and deployed at a rapid pace. The first major conflict to see armed drones deployed at scale was the Second Gulf War; the United States was flying as much as 1500 hours a month[4]. By mid 2006, it was flying 9000 hours a month. In 2010 in Afghanistan, it was flying 500 hours a day with just Predators. Even in 2011, as the US operated over 60 drone bases worldwide, they began to realize the technology was going to proliferate around the world, with over 50 countries already possessing the technology and seeking means to militarize it[5]. Meanwhile, nearly a decade later, Canada still struggles to formally adopt even unarmed drone technology within our components.

THE RCN EXPERIENCE

The RCN has conducted a number of limited tests and trials with Unmanned Aerial Vehicles (UAVs) to begin to understand how the technology might influence maritime operations in the air, surface, and sub-surface domains. Between 2012 and 2014, the RCN employed the Boeing Scan Eagle UAV onboard HMCS CHARLOTTETOWN, HMCS REGINA, and HMCS TORONTO[6]. The Scan Eagle could be launched from the flight deck of

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[4] Medea Benjamin, *Drone Warfare: Killing By Remote Control* (New York: OR Books, 2012), pages 56-57
[5] Ibid, page 68
[6] Canada, Department of National Defence, "RCN experimenting with unmanned capabilities at sea", Last modified 28 November 2016, http://www.navy-marine.forces.gc.ca/en/news-operations/news-view.page?doc=rcn-experimenting-with-unmanned-capabilities-at-sea/ivxn59ye

the frigate and provided a capability of over-the-horizon reconnaissance and intelligence gathering, with a maximum flying altitude of 5,943 meters and up to 24 hours of flight time[7], a significant improvement over the on-station time of the Sea King helicopters. While the technology proved to be a great success, greatly extending the range of the ship's sensors and intelligence gathering capabilities, the RCN has not since deployed with UAVs on operations.

The RCN does have one significant UAV project in process to return the capability to deployed platforms. The RCN Intelligence, Surveillance, Target Acquisition and Reconnaissance Unmanned Aircraft System (RCN ISTAR UAS) will provide an over-the-horizon airborne capability for situational awareness and to reduce risk to both the platform, the crew, and to the embedded Cyclone Maritime Helicopter[8]. The ISTAR project has an initial delivery date of 2022[9], which if achieved will lead to a decade gap since the limited introduction of the Scan Eagle. According to the RFP[10], only one complete system with a single ground station that would be installed onboard the Halifax class is being procured with 6-12 aircraft, at a total project cost of $50M to $100M.

On 10 May 2019, Canada announced that QinetiQ was awarded a $51M contract to provide the RCN ISTAR UAS system to both the RCN and CANSOFCOM[11]. Quineti is therefore now contracted to provide a UAS that is based on the UMS SKELDAR V-200, a

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[7] Boeing, "ScanEagle", Last Accessed 20 May 2019, https://www.boeing.com/defense/autonomous-systems/scaneagle/index.page

[8] Canada, Department of National Defence, "Royal Canadian Navy Intelligence, Surveillance, Target Acquisition and Reconnaissance Unmanned Aircraft System", Last modified 10 January 2019, http://dgpaapp.forces.gc.ca/en/defence-capabilities-blueprint/project-details.asp?id=1297

[9] Ibid

[10] Canada, Public Services and Procurement Canada, "RFI for RCN ISTAR UAS Project Solicitation # W8471-175664", Last Modified 16 February 2017, https://buyandsell.gc.ca/cds/public/2017/02/16/4cae90b89d25bce148942bca1dea0247/ABES.PROD.PW__QD.B037.E26189.EBSU000.PDF

[11] Naval Technology, "QinetiQ to supply unmanned aircraft systems to Canadian Armed Forces", Last modified 10 May 2019, https://www.defenceconnect.com.au/key-enablers/4006-qinetiq-secures-c-51m-contract-to-support-canadian-armed-forces-uas-program

vertical lift helicopter-style aircraft with an active radar and electro-optic infrared (EO/IR) video camera system[12]. With one ground station as part of the RFP, it is most likely that this system will be mission-fit on one of the high readiness deployers, depending on the operation. This UAS does not possess an armed capability. At 4m in length and 1.2m in width, this UAS would not only be a potential fit for the HALIFAX class frigate or the future Canadian Surface Combatant (CSC), but would potentially be a relatively easy fit for the Arctic / Offshore Patrol Vessel (AOPV) or Joint Support Ship (JSS).

It remains to be seen how the RCN actually deploys this new UAS system, and whether it will be physically controlled by RCN uniformed operators, RCAF operators, or contractors. Regardless of whether it is RCAF or RCN personnel stationed on the naval platform, it is essential that the CAF takes control of the drone agenda and begin using them beginning right from initial Force Generation activities as a new way of doing operations. While it is always a positive step in the right direction to get into contract with any new capability, the RCN should be prepared to move out more aggressively to increase both the overall drone capacity as well as start projects on delivering an actual armed capacity.

The Royal Australian Navy is moving out more aggressively than Canada on deploying drones on their surface navy. While not yet leaning into armed drones, Project Sea 129 Phase 5 Maritime Tactical Unmanned Aerial Systems will deploy an unarmed UAV on its entire future navy, including nine future frigates and a dozen offshore patrol vessels. The Royal Australian Navy has already selected the German-designed PV 80 as its offshore patrol vessel, a ship which is only 80 meters in length, displacing 1486 tonnes[13]. By comparison, there is currently no

[12] UMS Skeldar, "V-200 Skeldar Unmanned, Versatile & Mission Ready", Last Accessed 20 May 2019, https://umsskeldar.aero/wp-content/uploads/V-200_softcopy-2018.pdf
[13] Lurssen, "OPV 80 Data and Information", Last Accessed 21 May 2019, https://www.luerssen-defence.com/opv-80/

planned UAV capacity for the RCN's Harry Dewolf-Class Arctic/Offshore Patrol Ship, which by comparison is significantly larger at a length of 103 meters and estimated displacement of 6440 tonnes[14]. Even Canada's Kingston Class are only about 1/3rd smaller than the RAN PV-80 class, at 55 meters and 970 tons, showing that RCN should even be considering investigations for both the entire current and future fleets.

ARMED DRONE THREAT ENVIRONMENT

The potential threat environment of armed drone consists of both state and non-state elements. In terms of states, the proliferation of armed and unarmed drone technology, both autonomous and remote controlled, continues to evolve. As China continues to modernize and expand its military, "*advances are most evident in unmanned aerial vehicles (UAVs)...also accelerating development of unmanned undersea vehicles (UUVs) and unmanned surface vessels (USVs)*[15]". China has invested in all potential avenues of development, from military research and development, to funding at universities, and private corporation development and export sales. As China stretches out its influence in the South China Sea, unmanned drone technology will help it monitor and enforce maritime disputes, but also domestically for disaster response and humanitarian assistance.

The second order effect of Chinese drone development relates directly to the non-state threats that Canada faces, especially the RCN, in areas in which it is required to operate such as the waters surrounding the Middle East. In conflicts such as the civil war in Yemen, armed drones and drone strikes have been appearing in large numbers. Regional state powers have been

[14] Canada, Department of National Defense, "Arctic and Offshore Patrol Ship Project", Last modified 9 April 2019, http://www.navy-marine.forces.gc.ca/en/fleet-units/aops-home.page
[15] Chase, M. *et al*, "Emerging Trends in China's Development of Unmanned Systems", *RAND Corporation,* 2015, https://www.rand.org/pubs/research_reports/RR990.html

rapidly procuring drone technology as well; countries such as Iraq, Jordan, Saudi Arabia, and the UAE have all purchased Chinese armed drones, which has been influenced by a decline in American arms sales in the region[16]. For other countries such as Israel, Turkey, and Iran, they have been building the capacity domestically in response. Drone strikes are a common occurrence in the Yemeni civil war and have given the Houthi rebels the ability to strike at targets in nearby Saudi Arabia up to a thousand kilometers away, such as oil infrastructure[17].

The most iconic armed drone of this new era in warfare is the Predator, which became invaluable to the United States as the preferred precision targeting vehicle, giving commanders the ability to identify, classify, track, engage, and damage assess targets in a single platform[18]. With production ended in 2011, next generation UAVs are being developed and produced, such as the MQ-9 Reaper[19]. These platforms are more capable than ever, with longer ranges, more sensors, and higher payloads, and with increasing autonomous capabilities. But the type of threat that has a high potential to affect the RCN in future operations are the so-called miniaturization of the drone threat.

The cost effectiveness and mass commercialization of very capable unarmed drones has enabled non-state groups increase their force projection capabilities in a way that has not been before seen. Terrorist organizations and insurgent groups can purchase commercially available and inexpensive drones from any number of providers, attach explosives and a basic delivery

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[16] Jon Gambrell and Gerry Shih, "Chinese armed drones now flying over Mideast battlefields", *Military Times*, Last Modified 3 October 2018, https://www.militarytimes.com/news/your-military/2018/10/03/chinese-armed-drones-now-flying-over-mideast-battlefields-heres-why-theyre-gaining-on-us-drones/

[17] Gulf News, "Saudi Arabia oil stations attacked by drones", Last Modified 14 May 2019, https://gulfnews.com/world/gulf/saudi/saudi-arabia-oil-stations-attacked-by-drones-1.63934993

[18] Roger Connor, "The Predator, a Drone That Transformed Military Combat", *Air and Space Museum Aeronautics Department*, Last Modified 9 March 2018, https://airandspace.si.edu/stories/editorial/predator-drone-transformed-military-combat

[19] US Air Force, "MQ-9 Reaper", Last Modified 23 September 2015, https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104470/mq-9-reaper/

device, and suddenly possess a capacity not entirely dissimilar from a Predator drone; an ability to identify and classify targets through video on the drone, and an engagement platform followed up by damage assessment either through additional drones or through traditional or non-traditional (e.g. Twitter). These attacks have been prevalent throughout the conflict in Iraq and Syria and continue to proliferate all over the world[20].

IMPLICATIONS TO THE RCN

The threat to the RCN from armed mini-drones is two-fold. Naval platforms in low threat environments can often be found in port, dense urban environments where drones can be launched from virtually any direction. In the open ocean, the threat is significantly diminished, but not eliminated, as more, well funded asymmetric groups may possess the finances necessary to obtain longer range commercial UAV technology. The Houthi rebels have shown a remarkable ability to deploy their capability, likely obtained through the Iranians, but have capably used to strike targets up to a thousand kilometers away. Littoral areas and narrow transits are a much higher threat area, one where naval ships could easily find themselves under attack but also able to counter attack with less fear of collateral damage.

Technology to counter drone attacks is available; one study indicated up to 235 such systems are under development[21] using a wide variety of detection and engagement techniques. While anti-drone technology may be somewhat similar in concept to anti-missile technology that is usually found on most naval platforms, there are significant differences in terms of the exact detection and engagement methods. Military grade anti-aircraft and anti-missile defensive

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[20] Patrice Deschenes, "The Rise of the Drones: Technological Development of Miniaturised Weapons and the Challenges for the Royal Canadian Navy", *Canadian Military Journal Vol 19 No 2,* http://www.journal.forces.gc.ca/Vol19/No2/page51-eng.asp

[21] Arthur, Holland, Michel, "Counter-Drone Systems", *Center for the Study of the Drone at Bard College*, February 2018, https://dronecenter.bard.edu/files/2018/02/CSD-Counter-Drone-Systems-Report.pdf

systems are typically designed to combat relatively larger and likely faster moving targets; drone attacks are likely to be slower, smaller, and low-flying[22]. The capacity to detect and engage a drone threat must become an essential part of future RCN platforms.

OTHER USE CASES

Aside from the requirement to obtain sea control and project power, drone technology gives the RCN a better capacity to undergo other missions that the service is often called upon to conduct. The RCN's current coastal defense capability consists of the MCDVs and, in the relative near future the AOPV. The armament on both vessels is relatively light compared to a major combat ship. The addition of some type of armed drone capability to these platforms would be a massive force multiplier.

With a growing history of deploying MCDVs to missions such as OP CARRIBE[23], the platforms originally designed for coastal defence are capably conducting maritime surveillance and interdiction operations. While the RCN does not typically engage in hostile actions during OP CARRIBE, the addition of armed drone technology would add a significant credible threat to the platform that would give the naval vessels a stronger ability to enforce their mandate. As well, it is virtually certain that the AOPV will be conducting operations such as OP CARRIBE within a relatively short period of time after becoming fully operational this year, giving the RCN more reasons to acquire additional deployable drone capabilities.

Armed drones will not only allow the RCN platforms to conduct surveillance at range but also enforce sovereignty more effectively. As a maritime nation with the longest coastline in the

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[22] Ibid

[23] Canada, Department of National Defence. "Operation CARIBBE", Last Modified 27 November 2018, https://www.canada.ca/en/department-national-defence/services/operations/military-operations/current-operations/operation-caribbe.html

world, Canada lacks an ability to both monitor and enforce sovereignty through its military forces. By extension, there is an "irrevocable maritime component to Canada's strategic interests[24]", which includes a long list of military requirements including the ability to protect our domestic waters from attacks from sea lanes, protection of trade, and preventing enemies from using our territory from attacking our neighbour to the south.

The rest of the world has either already adopted armed drone technology or is preparing to do so. There is an imperative for the CAF at large and the RCN in particular to begin regular Force Generation and Force Employment with drones, such that they can begin to develop the doctrine and tactics necessary for new capabilities. The use of armed aerial drones is just the beginning for remote and autonomous armed technology which will rapidly extend into other domains. The United States already has a fully autonomous capable warship, the Sea Hunter[25], originally envisioned as a potential anti-submarine platform including weapons, but now is being considered as part of a wider fully networked fleet which would include both larger and smaller ships to obtain a "distributed lethality[26]", requiring enemy states to consider every ship as a threat, not just large combatants.

CONCLUSION

The world's military forces are moving rapidly towards autonomous and remotely enabled weapons systems. In addition, the proliferation and distribution of the technology,

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[24] Ben Lombardi and Bill Ansell, "Military Planning, Canada's Strategic Interests and the Maritime Domain", *Canadian Military Journal Vol 18 No 4,* http://www.journal.forces.gc.ca/vol18/no4/page4-eng.asp

[25] Naval Technology, "Sea Hunter: inside the US Navy's autonomous submarine tracking vessel", Last Modified 3 May 2018, https://www.naval-technology.com/features/sea-hunter-inside-us-navys-autonomous-submarine-tracking-vessel/

[26] Defense News, "US Navy moves toward unleashing killer robot ships on the world's oceans", Last Modified 15 January 2019, https://www.defensenews.com/naval/2019/01/15/the-us-navy-moves-toward-unleashing-killer-robot-ships-on-the-worlds-oceans/

through both ad-hoc commercial means but also from increasing arms sales from countries like China, has increased dramatically in recent years. Both smaller states and non-state actors such as criminal and terrorist organizations can readily possess advanced precision strike capability which was only a decade ago only available to a few advanced countries in the world. The RCN must move ahead to at least stay pace with technological developments already seen active in theatres such as Yemen and being used in the South China Sea. Presently, the RCN only has a single project delivering one complete UAS system to be shared amongst the current and future fleet. This level of deployment of even unarmed drone technology puts us behind the rest of the world. SSE already calls for the deployment of remote technology and the RCN Strategic Plan calls for the RCN to remain technologically focused, adaptive, and flexible. It's time for investments to be made to bring us into the future.

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