



## UNMANNED TECHNOLOGY IN THE RCN

One of the most significant military developments thus far in the 21<sup>st</sup> century has been unmanned systems. From humble beginnings as tactical reconnaissance tools, unmanned aerial systems/vehicles (UAS/UAVs) – which some people refer to as drones – have quickly evolved into a wide array of sophisticated military applications. Today these assets serve in a variety of roles from sustained long-range surveillance and targeting to ground attack. And as technology improves, the unmanned vehicles are now not just in the air, but on the ground and in the water, and below the sea's surface. The variety of unmanned vehicles is astounding – from UAVs the size of a hummingbird to ones weighing in at 15 tons. As technology advances, the variety of unmanned systems will expand, but whether smaller or larger, all of them will be more capable, more lethal and, in some cases, more autonomous.

In recent years the Canadian Armed Forces (CAF) in general, and the Royal Canadian Navy (RCN) specifically, have studied several applications for unmanned systems, with an eye towards adding these capabilities to Canadian naval vessels. The rapid development of unmanned surface vehicles/vessels (USVs) and unmanned underwater vehicles/vessels (UUVs), and their increasing sophistication, offers navies a new range of capabilities – as well as a new set of threats against which they must guard.

The CAF have been using UAVs for years. Several unarmed models were tested by the CAF in Afghanistan, including the CU-161 Sperwer, which was later dropped in favour of the more reliable 250 kg CU-170 Heron. Both UAVs provided invaluable surveillance and target acquisition tools.<sup>1</sup> It was, however, the performance of larger American systems, like the Predator and Reaper aircraft, which indicated a real shift in military technology. Operating over the skies of Afghanistan, Iraq, Yemen, and elsewhere, American UAVs advanced rapidly in capability and utility, and the rest of the world has taken note.

While most of the research and development focus for UAVs has centred on their use by ground and air forces, the benefits to maritime forces are equally clear. Most importantly they offer long-range surveillance, extending a ship's situational awareness over the horizon and beyond the range of its onboard sensors. This capability traditionally requires expensive aircraft flying off carriers or helicopters carried by major warships. UAVs offer ships some of the same capabilities at a fraction of the cost and greater sustainability. An embarked helicopter on a typical six-month deployment, for instance, flies approximately 500 hours, whereas a UAV can spend twice that time in the air over the same deployment.<sup>2</sup> The UAV capabilities can also be dispersed more broadly as the variety of unmanned vehicles increases; smaller ships can carry light drones, while larger ships can carry several systems, launched simultaneously in multiple directions. In a combat situation the improved tactical picture provided by more eyes in the sky could make all the difference. Modern anti-ship missiles are potent weapons and the vessel locating its opponent first has an obvious advantage.

But for every advance in security, there is usually an equal and opposing advance in

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<sup>1</sup> Rob Cook, "Drones and the Canadian Forces," CDA Institute, February 2013.

<sup>2</sup> Brett Ruskin, "Drones Expected to Fly Missions from Canadian Naval Ships within Decade," *CBC News*, 24 February 2017.

insecurity – just as the unmanned systems will be a boon to the defence of ships, they will also allow for new forms of attack. Defending a ship from hostile drones has become a vexing defensive problem. As UAVs get smaller, faster and harder to detect, they pose new risks to a ship’s defences. Advances in software have also made it possible to connect multiple, explosive-laden drones into swarms that may be able to overwhelm even advanced defence systems.<sup>3</sup> Unmanned surface vehicles pose a similar problem. For example, in 2017 an unmanned boat packed with explosives rammed the Saudi frigate *Al-Madinah* off Yemen, killing two sailors and damaging the ship.<sup>4</sup>

The RCN has long recognized the potential value of, and dangers posed by, UAVs and USVs in naval operations. During *Operation Nanook 2018*, HMCS *Charlottetown* used an unmanned boat to simulate a strike akin to that which damaged *Al-Madinah* the year before, using its 57mm gun to engage the boat as it made simulated attack runs against the frigate. As well, for several years the RCN has been using Canadian-made Hammerhead unmanned target systems to practice defence against attack. This unmanned vessel allows naval personnel to train to respond to fast attack craft, and it can be used in swarms to replicate a coordinated attack by multiple vessels.

Adding UAVs to the fleet has been an RCN objective for several years. The navy has already had some success operating the Scan Eagle system from deployed frigates. Between 2012 and 2014, the trial deployment of this UAV expanded ship surveillance capabilities, leading to several interceptions of suspicious vessels and the seizure of over nine metric tons of illegal drugs by HMCS *Charlottetown*, *Toronto* and *Regina* during anti-drug operations.<sup>5</sup> Adoption and adaptation of the systems continue.

The RCN is also working with the nine kilogram Snyder micro-unmanned aerial system, currently being used as a live-fire target to simulate enemy drone attacks on RCN vessels, but which also provides the navy with the basic experience needed to scale up to larger projects.<sup>6</sup> That scaling up took a step forward in 2018 when MDA – a Canadian space technology company – signed a contract to provide the Department of National Defence with Puma Maritime Miniature Unmanned Aircraft Systems (MMUAS). The MMUAS is the first UAS project that the RCN will operate and maintain as its own capability and extend the reach of ships’ communications and sensors over contentious or hostile areas during maritime security operations.<sup>7</sup> The Puma is capable of staying in the air for approximately two hours and can fly at an altitude up to 3,200 metres (10,500 feet) with a range of 20 kilometres, providing ‘over the horizon’ intelligence and surveillance capability to the ship. The system began coming online in 2019,<sup>8</sup> and several *Kingston*-class Maritime Coastal Defence Vessels now have the capability.

Plans for even larger systems are well underway. Currently, the Director of Naval Requirements is leading the first phase of the unmanned system program, designed to acquire a family of drones that can be operated from all Canadian warships to provide near real-time

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<sup>3</sup> Royal Canadian Navy, “Snyder drone clears path for future systems,” October 2018.

<sup>4</sup> Kyle Mizokami, “Suicide Strike on Saudi Frigate was a First Carried out by Drone Boat,” *Popular Mechanics*, 21 February 2017.

<sup>5</sup> “Navy Experiments with UAVs,” *CFB Esquimalt Lookout Navy News*, 22 November 2016.

<sup>6</sup> Ibid.

<sup>7</sup> “MDA to provide unmanned aircraft systems to Royal Canadian Navy,” *Skies*, 14 February 2018.

<sup>8</sup> “Advanced unmanned aircraft to provide eye in the sky for Kingston-class ships,” RCN, 18 February 2019.

intelligence, surveillance, target acquisition and reconnaissance (ISTAR) information.<sup>9</sup> The navy is looking for a drone with a minimum flight time of six hours and a range of at least 92 kilometres.<sup>10</sup> A request for proposals is scheduled to be issued for this project in 2020 with the expectation that the UAV model that is selected will be provided some time in 2021.<sup>11</sup>

The RCN is also exploring the use of unmanned boats for dangerous tasks such as mine hunting. Canada is in the process of purchasing remote mine hunting and disposal systems for the *Kingston*-class ships. This will enhance the ships' mine-hunting capability and underwater domain awareness. A preliminary estimate is that the system will be in service by 2022.<sup>12</sup>

There are several final notes that should be made about unmanned technology. First, the navies of Western countries are all experiencing personnel shortages – indeed some navies have had to dock ships because they cannot crew them – and the idea of using unmanned ships has the potential to solve this problem. In the long term, it is possible that unmanned systems may begin replacing warships themselves.

Second, having said this, 'unmanned' technology does not mean that there is no personnel involved. The unmanned systems require a team of personnel to operate them, to launch/recover them and to maintain them. The systems themselves may be unmanned but they have substantial support teams that go with them.

Third, depending on the system, there may be cost savings to using unmanned systems. However, this is not the case across the board – the US Navy Global Hawk surveillance drone shot down by Iran in June 2019, for example, cost more than an F-35 fighter jet.

And, finally, in the near future these systems will go from simply being unmanned to being autonomous. The difference is stark – picture yourself in a field with a remote-controlled aircraft. Although there are great variances within the category, an unmanned system is like you operating that aircraft – you are in control and give the commands in real-time. An autonomous system or vessel, however, is generally pre-programmed to perform a certain task. For example, it might be programmed to travel to Hawaii and monitor shipping or pollution along the way. Once programmed, it can go on its way without someone controlling it remotely. (That's not to say that someone wouldn't be *monitoring* it, but they would not be controlling it.)

The US Navy has been working on unmanned autonomous vessels for years, as has China, and both countries have made significant advances. For example, in early 2019, the USN's 132-foot Medium Displacement Unmanned Surface Vessel (MDUSV), *Sea Hunter*, became the first ship to navigate autonomously from San Diego to Pearl Harbor, Hawaii, and back. This was done without a single crew member onboard, except brief boardings by personnel from an escort vessel to check electrical and propulsion systems. *Sea Hunter* is capable of traveling for long periods of time and executing a variety of missions.

Autonomous unmanned systems will be able to operate at great distances, for long times without someone at the controls at all times. This will truly represent a sea change in naval operations. And, as for any new technology, these systems will have implications for both offence and defence in the maritime realm.

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<sup>9</sup> Darryl DeJong, "RCN on track to acquire unmanned aircraft systems," *Navy News*, 4 January 2018.

<sup>10</sup> Ruskin, "Drones Expected to Fly Missions from Canadian Naval Ships within Decade."

<sup>11</sup> *Ibid.*

<sup>12</sup> "Navy Experiments with UAVs," *CGB Esquimalt Lookout*, 22 November 2016.