UNMANNED TECHNOLOGY IN THE RCN

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The technology relating to unmanned/uncrewed systems has developed rapidly in the past 20-25 years. And this has led to exponential growth in the adoption and use of unmanned systems by militaries. In terms of naval systems, we regularly hear about new tests and exercises involving unmanned aerial vehicles (UAVs), unmanned surface vessels (USVs) and unmanned underwater vessels (UUVs) as they are integrated into naval forces around the world. In this Briefing Note we will examine what Canada, the Royal Canadian Navy (RCN) in particular, is doing about unmanned technology. Like other countries, in recent years the Canadian Armed Forces (CAF) in general, and the RCN specifically, have begun adopting unmanned systems. The development of unmanned vehicles/vessels – whether for use in the air, on the surface or underwater – offers maritime forces a new range of capabilities.

Let's start by discussing UAVs, which the CAF has been using for years. Today these UAVs serve in a variety of roles from long-range surveillance and targeting to ground attack. Several unarmed models were tested by the CAF in Afghanistan, including the CU-161 Sperwer, which was later replaced by the CU-170 Heron and ScanEagle. These UAVs provided valuable surveillance tools.

While most of the focus for UAVs has centred on their use by ground and air forces, the benefits to maritime forces are 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 required helicopters flying off warships (and/or planes flying off aircraft carriers). UAVs offer ships some of the same capabilities often at a fraction of the cost and greater sustainability. As well, another benefit is that the variety of UAV capabilities now available allows them to be dispersed among the assets of a fleet according to the capacity of the ships. Thus small ships can carry small and light UAVs, while large ships can carry large UAVs or several systems at once.

It should be noted, however, that UAVs operated by the RCN are subject to some of the same limiting factors as helicopters. For one thing, the personnel who are responsible for operating/flying and maintaining the systems can only work so many hours per day. Also, because the ships will not necessarily have space for extra crews, these tasks may be added to the regular jobs of personnel. As well, just as helicopter operations are limited by weather and sea states, so are UAV operations – indeed a small UAV will be more affected by winds than a helicopter. A final note here is that ships must be cognisant of other air traffic. If an RCN ship is utilizing UAVs, it will be crucial to ensure that they are not interfering with civilian air traffic or the operation of other maritime military air assets, and some RCN ships do not have the ability to undertake air traffic management. The same is true of surface and sub-surface unmanned systems. They must be deconflicted with other vessels using the water – both civilian and military.

The RCN has been adding UAVs to the fleet for years. The navy has operated the ScanEagle system from frigates since a trial deployment between 2012 and 2014. This UAV has expanded ship surveillance capabilities, leading to several interceptions of suspicious vessels and the seizure of illegal drugs during counter-drug operations. The RCN has also worked with the

Snyper micro-UAV as a target to simulate attacks on RCN vessels so personnel can train to react to attacks by single or multiple UAVs. The RCN began using the Puma Maritime Miniature Unmanned Aircraft System (MMUAS) in 2019 on its *Kingston*-class ships. The MMUAS is the first unmanned aerial system (UAS) project that the RCN operates and maintains as its own capability.[1] 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. It has been trialed in the RCN's new Arctic and Offshore Patrol Ship HMCS *Harry DeWolf*.

Plans for other systems are well underway. Currently, the Director of Naval Requirements is leading the unmanned system program, designed to acquire a family of systems that can be operated from all Canadian warships to provide near real-time intelligence, surveillance, target acquisition and reconnaissance (ISTAR) information.[2] In 2018, the RCN signed a contract with a company called Qinetiq to deliver an ISTAR UAV capability based on a platform called Skeldar. In 2021 the ISTAR project was in the definition phase, and the plan is to acquire a tactical remotely piloted aircraft system for the RCN's *Halifax*-class ships. In August 2022, the RCN issued a Request for Proposals for an ISTAR UAV, with a closing date of 31 March 2023.

After this brief survey of some of the RCN's aerial systems, let us now briefly examine some of its surface and underwater vessels/vehicles (USVs and UUVs). Both USVs and UUVs can provide a variety of benefits to a naval fleet. For years the RCN has been using Canadian-made Hammerhead unmanned target systems to practice defence against attack. The Hammerhead is the size of a small motorboat and is capable of significant speeds. It 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. Training to defend against attack by small, fast explosive-laden craft is important because there have been a number of attacks on ships conducted via this method.

The RCN is also exploring the use of both surface and underwater unmanned vessels for dangerous tasks such as mine hunting. There are already USVs that can detect and disarm sea mines. And UUV technology has advanced such that there are vessels that are able to do surveillance, mapping as well as contributing to anti-submarine warfare by detecting and dealing with other sub-surface threats. The Remote Minehunting and Disposal System (RMDS) project was launched in 2018 to provide the RCN with the capability to conduct the full spectrum of naval minehunting operations and contribute to underwater domain awareness.[3] The RMDS employs combined commercial and government-developed technology to detect, identify and dispose of sea mines and underwater explosive devices.[4] The RMDS contains modular sub-systems that are portable and deployable.

In July 2022, Cellula Robotics demonstrated to RCN and Australian representatives its Solus-LR hydrogen fuel cell-powered Autonomous Underwater Vessel (AUV) off British Columbia. The demonstration included the autonomous launch of a micro-AUV from Solus-LR while submerged and underway – in effect, an AUV launched from a larger AUV. Communication with a ship or shore facility is crucial for unmanned vessels, to pass along

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[1] Government of Canada, DND, "RCN joins NATO Initiative to Learn from Allies' Unmanned Systems," 4 February 2021, RCN joins NATO initiative to learn from allies' unmanned systems - Canada.ca

[2] Ibid.

[3] In recognition that NATO members benefit from learning from each other, Canada joined the NATO Maritime Unmanned Systems Initiative (MUSI) in 2021. Ibid.

[4] Government of Canada, DND, "Remote Mine Hunting and Disposal System," 2018.

situation awareness as well as data that have been collected, but underwater this is challenging. The Solus-LR demonstration illustrated the system's ability to communicate as the AUV surfaced and transmitted a status message via satellite, illustrating near real-time, over-the-horizon communications from a submerged AUV.[5]

We have discussed just a few examples of the unmanned technology used by, or in development by, the RCN. There are several notes to make here before we conclude. First, it will be important for the RCN, the CAF and Canada in general, to consider and develop policy that applies to these systems. How will they be used, and in what circumstances? Will they be armed and, if so, under whose control? Second, as the systems become more autonomous and utilize Artificial Intelligence and advanced data analytics, the question of use and control will become even more salient. And third, while *unmanned*, these systems nonetheless require personnel to operate and maintain them. The RCN will need either to recruit or to train new personnel to ensure that these systems can be fully integrated into the ships of the fleet.

These platforms are key enablers of modern maritime forces, and the RCN is joining in the unmanned system revolution. In this brief discussion, we can see that the RCN is developing and adopting unmanned systems that will be helpful for Canadian missions – from surveillance of Canada's three ocean approaches to charting the waters in the Arctic, to adapting to new threats and challenges.

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[5] Phoebe Grinter, "Hydrogen Fuel Cell Powered AUV Completes Successful Demonstration Missions," Unmanned Systems Technology, 16 August 2022.