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## THE CASE FOR ARCTIC OFFSHORE PATROL VESSELS CONTRIBUTING TO ARCTIC HYDROGRAPHIC SURVEY

Lieutenant-Commander M.S. Arthur

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**THE CASE FOR ARCTIC OFFSHORE PATROL VESSELS CONTRIBUTING TO  
ARCTIC HYDROGRAPHIC SURVEY**

**Lieutenant-Commander M.S. Arthur**

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## AIM

1. The aim of this paper is to recommend that the Royal Canadian Navy (RCN) make hydrographic survey of the Arctic a core task of the HARRY DEWOLF (HDW) class Arctic and Offshore Patrol Vessels (AOPVs) as they are brought into service starting in 2020. Doing so provides information on the problem space of inadequate Arctic charting. It also supports a case for the operational and strategic advantage to an RCN/ Canadian Hydrographic Service (CHS) partnership in meeting this challenge. Finally, it provides broad recommendations for the short and medium term efforts necessary in taking up this task.

## INTRODUCTION

2. When Her Majesty's Canadian Ship (HMCS) HARRY DEWOLF completes acceptance trials in the spring of 2020 it will mark the start of a paradigm shift for RCN deployment to the Arctic. For the following five years, the RCN will receive one more AOPV annually, dramatically increasing the number of units available for Arctic operations. When all ships have entered service, between four and five AOPVs are intended to be deployed to the Arctic for between two and four months annually<sup>1</sup>. This means that in 2025 and beyond the RCN could see up to fifteen months of Arctic AOPV operations annually. While good for demonstrating Canadian interest in the north, this level of deployment will highlight the inherent danger of operating in the Arctic. Specifically that the region is very poorly charted with only ten percent of Arctic waters being adequately surveyed and a scant one percent being surveyed to modern standards.<sup>2</sup> Further, based on current trends, CHS will not be able to complete modern Arctic hydrographic survey even within the next thirty years.<sup>3</sup>

3. This service paper will look first at the changing Arctic environment with a view to identifying both the challenge and opportunity that climate change is rapidly delivering. It will then examine the state of charting in the Arctic and the ability of the CHS to complete modern bathymetric survey of the region. The interrelation of the problem and RCN interests is reviewed primarily through the lens of AOPV core missions and CAF/RCN strategic doctrine. Lastly, it will look at historic and contemporary examples of CAF survey operations and consider what such support should look like during the next eighteen years.

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<sup>1</sup> Canada, Department of National Defence. HARRY DEWOLF Class Arctic/Offshore Patrol Ship Concept of Use. Ottawa, 2015

<sup>2</sup> Canada, Fisheries and Oceans Canada. "Arctic Charting." Last accessed 22 October 2019.  
<http://www.charts.gc.ca/arctic-arctique/index-eng.html>

<sup>3</sup> Matthew Arthur telephone conversation with CO HARRY DEWOLF, Cdr Corey Gleason, 27 September 2019

## DISCUSSION

### Arctic Environment in the Present and Near Future

4. In final form, the AOPVs look markedly different from the armed heavy icebreakers originally announced by Prime Minister Harper in 2007<sup>4</sup>. While deviation from his stated intent may have garnered criticism through the tender process, the AOPVs themselves may prove much more useful than icebreakers during the coming decades. Largely, this is because the Arctic is rapidly changing in ways that make a lighter ice-hardened hull more sensible than one designed to break multi-year ice formations. When Canadians first laid claim to our northern archipelago in 1925<sup>5</sup>, the summer icepack density meant that transit of the Northwest Passage could take three years.<sup>6</sup> This character necessarily directed and limited maritime traffic in the north. Starting in the 1980s, however, there was a distinct and measurable trend towards recession of the ice fields and an increased expanse of open water. This trend strengthened significantly during the twentieth century. As a result, projections by the National Oceanographic and Atmospheric Association (NOAA) now predict that the entire Arctic ocean may be devoid of summer ice as early as 2037.<sup>7</sup> In the interim, the southern portions of Canada's archipelago and the Northwest Passage are already increasingly ice-free, as the past eighteen years have demonstrated the lowest recorded summer ice levels ever recorded in the region<sup>8</sup>.

5. While climate change works to open sea routes to marine traffic, a significant abundance of resources in the region has also been identified, sparking interest from all Arctic nations and beyond. The region has a proven store of 240 billion barrels of oil and analysis of Arctic rock formations indicate a likely 90 billion more undiscovered barrels<sup>9</sup>. Currently, increased marine traffic associated with ice-free sea routes and economic enterprise transits an area which remains dangerously under-surveyed. Despite what is still a minimal concentration of maritime traffic, groundings are a too common occurrence. In 2010, a community-supplying tanker ran aground on unmarked dangers in Simpson Strait<sup>10</sup> while carrying over 9 million litres of fuel. Increased Arctic tourism, meanwhile, has led to annual groundings by Arctic capable mega yachts and cruise ships as recently as 23 August 2019<sup>11</sup>. Thus far, these incidents have been troubling but

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<sup>4</sup> Pugliese, David, "Deliver of first new Arctic patrol ship delayed again, but still expected sometime in 2019," National Post, 20 August 2019.

<sup>5</sup> McCormick, Ty. "Arctic Sovereignty: A Short History." Foreign Policy, May/June 2014; 206. Pg 20

<sup>6</sup> Rebecca Lindsey and Michon Scott, "Climate Change: sea ice summer minimum." National Oceanographic and Atmospheric Association, September 26, 2019. <https://www.climate.gov/news-features/understanding-climate/climate-change-minimum-arctic-sea-ice-extent>

<sup>7</sup> M. Wang and J.E. Overland, "A sea ice free summer Arctic within 30 years?" American Geophysical Union, 2009.

<sup>8</sup> Rebecca Lindsey and Michon Scott, "Climate Change: sea ice summer minimum." National Oceanographic and Atmospheric Association, September 26, 2019. <https://www.climate.gov/news-features/understanding-climate/climate-change-minimum-arctic-sea-ice-extent>

<sup>9</sup> McCormick, Ty. "Arctic Sovereignty: A Short History." Foreign Policy, May/June 2014; 206. Pg 20

<sup>10</sup> CBC News, "Fuel Tanker aground in Northwest Passage." Last accessed 23 October 2019. <https://www.cbc.ca/news/canada/north/fuel-tanker-aground-in-northwest-passage-1.879122>

<sup>11</sup> Canada, Canadian Hydrographic Service. ARHC9-B4.1, 9th Meeting of the ARCTIC REGIONAL HYDROGRAPHIC COMMISSION, Murmansk, Russia, 17-19 September 2019: National Report of Canada. Arctic Regional Hydrographic Commission, 2019.

have not resulted in significant environmental damage or loss of life. Given trends towards better Arctic access and increasing economic incentives to operate in the north, Canada's failure to chart its interior waterways may transition from the realm of inconvenience to one of strategic risk.

### **The State of Arctic Charting and CHS hydrographic survey capacity**

6. Given the timeline within which risk is escalating, one might reasonably assume that CHS would be resourced to make rapid progress in charting the Arctic. In reality, while funding has increased to the service in the last three years, their capacity still does not allow for meaningful progress to be made. An increased annual budget of 5.8 million is predominantly expended on contracted civilian vessels and funded coast guard support<sup>12</sup>. In 2019, a year of exceptional relative productivity, this budget enabled seven individual surveys to be conducted. These included four employing Canadian Coast Guard (CCG) vessels and three arranged by civilian contract<sup>13</sup>. While this represented an improvement over past years, CHS estimates still indicate a three-decade horizon to complete their work in the north. The organization is looking in all directions for usable Arctic data in the interim including crowd sourced bathymetric data<sup>14</sup> as a stop-gap where quality data is not available. In addition to multi-beam survey, CHS is deficient in transport support for their personnel needing conduct work ashore on related projects including development of a continuous Arctic vertical datum<sup>15</sup>. Looked at holistically, CHS possesses the personnel and expertise required to effectively chart the Arctic. Their delta lies in equipment, specifically in vessels capable of deploying to the region and enabling their efforts.<sup>16</sup> The problem space is simple to understand but likely insurmountable without a partner organization possessing the capacity they lack.

### **Interrelation of Arctic charting and AOPV employment**

7. Irrespective of their need, the RCN isn't directly required to support CHS survey operations. The Government of Canada has tasked the Department of Fisheries and Oceans with charting Canadian waters after all. Given that CHS isn't capable of completing this task in the short run, it is worth looking at whether or not it is in the RCN's own interest to do so. As the majority of units deployed to the Arctic in the coming decades will likely be AOPV, answering this question should involve a look at the class core missions and tasks delineated in the AOPV CONUSE. Task impact assessments follow below with each identified task being examined separately:

- a. Sovereignty Patrols. Where these patrols occur in the Arctic, until charting improves, they will be significantly limited in scope and inefficiently executed;

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<sup>12</sup> Matthew Arthur telephone conversation with RCN liaison to CHS, LCdr James Zuliani, 22 October 2019

<sup>13</sup> Canada, Canadian Hydrographic Service. ARHC9-B4.1, 9th Meeting of the ARCTIC REGIONAL HYDROGRAPHIC COMMISSION, Murmansk, Russia, 17-19 September 2019: National Report of Canada. Arctic Regional Hydrographic Commission, 2019.

<sup>14</sup> Email from RCN liaison to CHS LCdr James Zuliani, 23 October 2019

<sup>15</sup> *ibid*

<sup>16</sup> *ibid*

- b. Ready Duty Ship. This task should remain unaffected by Arctic charting;
- c. Maritime Domain Awareness; AOPV ability to operate in the Arctic will provide improved information into the Common Operating Picture held by Canada's Maritime Security Operational Centres. Limiting patrols to the 10% of the Arctic which is adequately charted will, in turn, limit AOPV effectiveness in conducting this task;
- d. Support to Joint Forces. Similar to the above, this task will be limited only where it is executed in the Arctic;
- e. Assistance to Law Enforcement. One element of this task which will be greatly affected is the capacity to facilitate the movement of law enforcement personnel to and from remote communities in the north. This task would often involve movement to and from remote communities<sup>17</sup>;
- f. Search and Rescue (SAR). While operating in the north, this mission will see compounding effects as increased shipping in poorly charted waters will both increase the frequency of SAR operations and amplify the danger of SAR response by an AOPV;
- g. Engagement. As this engagement in the north is largely expected to focus on remote communities, charting will factor largely in how easily and safely the task can be conducted;
- h. Humanitarian Assistance and Disaster Relief (HADR). While HADR is less likely to be a core task in the north than on other operations, a plane crash in 2011<sup>18</sup> demonstrated that this task can happen anywhere. Where air paths cross uncharted seas, this can be problematic for AOPVs if responding to a crash; and
- i. Support to Science Research and Development. As described in the CONUSE, "by nature of the operations HDW class will conduct in the North, there is considerable data that can be collected to help further understanding of the environment"<sup>19</sup>. If operations are limited to well charted regions, the data collected will, by definition, be of less value to researchers than if the area of operations was wider.

8. Clearly, a lack of modern bathymetry in the Arctic will not make deployment to the region impossible. The RCN already conducts operations, including Op NANOOK annually in

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<sup>17</sup> Note the tanker grounding referred to in para four occurred as the vessel attempted to resupply just such a community.

<sup>18</sup> Carlson, Kathryn. "Combination of factors blamed for fatal Resolute Bay plane crash." *Globe and Mail*, May 12 2018. <https://www.theglobeandmail.com/news/national/combination-of-factors-blamed-for-fatal-resolute-bay-plane-crash/article17657641/>

<sup>19</sup> Canada, Department of National Defence. *HARRY DEWOLF Class Arctic/Offshore Patrol Ship Concept of Use*. Ottawa, 2015

the north. An examination of CONUSE tasks does, however, make it clear that operations are rendered less effective and more dangerous by its absence.

### **Doctrinal Basis for supporting CHS**

9. It is evident from an examination of AOPV core tasks that the RCN's operational effectiveness in the Arctic would be improved by completing a modern survey of the region. Beyond this, the task of supporting CHS would not require a rethinking of Canadian Military Doctrine. Strong Secure Engaged promises that the "Defence team will: Enhance the mobility, reach and footprint of the Canadian Armed Forces in Canada's North to support operations, exercises, and the Canadian Armed Forces' ability to project force into the area"<sup>20</sup>. Separately the CAF is directed to help whole-of-government partners "deliver their mandates in Canada's North."<sup>21</sup> Overall, SSE's intent seems to harmonize well with DND/CHS collaboration on charting the Arctic. Further supporting this notion, Leadmark 2050 imagines HDW class ships acting as platforms for whole-of government operations<sup>22</sup> vice strictly for CAF priorities. The RCN Strategic Plan speaks of bringing AOPVs into service and employing them on Canada's three coasts<sup>23</sup> but leaves their scope of employment open. The only doctrine which could be amended to harmonize better with this task is the AOPV CONUSE itself. This document addresses Hydrographic Survey only as a mission fit to be embarked in the form of containerized payloads.<sup>24</sup> Future developments are identified as existing within the realm of Maritime Unmanned Systems<sup>25</sup> only. No discussion is made of support to ancillary hydrographic work specifically, and no mention of pole or hull mounted Multi-Beam Echo Sounder (MBES) use. In the event that hydrographic survey was to be prioritized as a core AOPV task, this CONUSE would require a minor amendment to reflect the task characteristics and priority. Otherwise, the task of hydrographic survey as part of a whole-of-government effort aligns well with DND and RCN doctrine.

### **The past and future of hydrographic survey from RCN ships**

10. When NORAD initially installed the Distant Early Warning Line radar system in northern Canada the process was significantly slowed by inadequate charting. This challenge was met by a combined force of United States Navy, CCG and Canadian Naval assets, including HMCS LABRADOR, an icebreaker outfitted for survey in support of this operation. Together, over the course of three years, the vessels charted 1000 nautical miles of coastline and enabled NORAD to achieve distant early warning of Russian attack.<sup>26</sup> This example resonates in a period where modernization of NORAD may call for improvements to this same system and where RCN support for hydrographic survey must again be considered. In the current century, as with

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<sup>20</sup> Canada, Department of National Defence. *Strong Secure Engaged: Canada's Defence Policy*. Ottawa: Canadian Defence Academy. 2017, pg 113

<sup>21</sup> Ibid. pg 113

<sup>22</sup> Canada, Department of National Defence. *Canada in a New Maritime World: LEADMARK 2050*. Ottawa, 2017. Pg 56

<sup>23</sup> Canada, Department of National Defence. *Royal Canadian Navy Strategic Plan 2017-2022*. Ottawa, 2017. Pg 14

<sup>24</sup> Canada, Department of National Defence. *HARRY DEWOLF Class Arctic/Offshore Patrol Ship Concept of Use*. Ottawa, 2015. Pg 25

<sup>25</sup> Ibid. 25

<sup>26</sup> McCormick, Ty. "Arctic Sovereignty: A Short History". *Foreign Policy*, May/June 2014; 206. Pg 33



the last, RCN ships have engaged in Arctic survey. Canada's annual Arctic exercise, Operation NANOOK has had several iterations which included RCN survey using pole mounted MBES embarked in Kingston Class ships<sup>27</sup>. Additionally, in 2017, Operation LIMPID saw RCN Hydrographic Service Office personnel embarked in HMCS KINGSTON to trial rapid Electronic Navigation Chart creation from MBES data collected by an HMC ship<sup>28</sup>. These successful collaborative efforts demonstrate the continued relevance of such activities but have been largely reliant on tactical level planners enabling them. As these tasks are not directed, they occur irregularly and were not scheduled in 2018 or 2019.<sup>29</sup>

11. CHS remains interested in RCN support to surveys in the north. They have indicated to their RCN liaison the presence of MBES units which CHS would be willing to transfer to the RCN to facilitate bathymetric data collection for CHS use.<sup>30</sup> Whether or not such units would be compatible with AOPV is undetermined but CHS interest is clear. The process of completing charting in the Arctic is complex, with industry and government input informing priorities<sup>31</sup>. Likewise, efforts at sea and ashore are both required to complete the modern survey that is required. Pole mounted MBES are not an efficient or ideal option for the majority of Arctic survey due to platform vibration and potential damage due to ice. In the short term, however, more of this survey type could be conducted along with transportation support to CHS personnel who need access to Arctic shoreline for the creation of an continuous Arctic vertical datum.<sup>32</sup> These efforts would further the overall project of Arctic survey while the AOPVs come into service and are outfitted for survey operations. AOPV outfitting would need to include installing MBES as this is the only efficient and sufficiently robust means of conducting large scale survey operations.<sup>33</sup> Based on feedback from AOPV project personnel, an Engineering Change would be the ideal process for installing such a system. This is primarily due to the expensive and lengthy process required to add a MBES to the project at this stage which is assessed as being more challenging than adding the capability to AOPVs following acceptance.<sup>34</sup>

## CONCLUSION

12. In examining the challenge presented by the dearth of modern bathymetric survey in the Canadian Arctic, it is evident that this is problem which needs to be addressed. Climate change induced melting is transforming the face of the Arctic in ways that draw shipping into our northern ocean. Regular grounding of vessels is already occurring on unmarked dangers within these waterways. Our HDW class ships will enter this area of operations within the next year with the mandate to execute a multitude of tasks in areas rife with unknown and unmarked

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<sup>27</sup> Email from RCN liaison to CHS LCdr James Zuliani, 23 October 2019

<sup>28</sup> Op LIMPID HSO Trip Report, emailed to LCdr Arthur, 23 October 2019

<sup>29</sup> MARLANT Unclassified Operational Schedule, last accessed, 23 October 2019

<sup>30</sup> Email from RCN CHS liaison, 22 October 2019

<sup>31</sup> Canada, Canadian Hydrographic Service. ARHC9-B4.1, 9th Meeting of the ARCTIC REGIONAL HYDROGRAPHIC COMMISSION, Murmansk, Russia, 17-19 September 2019: National Report of Canada. Arctic Regional Hydrographic Commission, 2019. Pg 3

<sup>32</sup> Email from RCN liaison to CHS LCdr James Zuliani, 23 October 2019

<sup>33</sup> Ibid

<sup>34</sup> Ibid

dangers. This presents risks to the ships, to their crews and to their assigned missions. Given the timeline of deployment and the likely increase in marine traffic, CHS is incapable of completing surveys in an acceptable timeframe without outside aide. Supporting this work with our AOPVs would address a desperate need, preserve operational effectiveness and safety while limiting strategic risk to Canada and the CAF. The RCN should commit to supporting CHS in conducting AOPV based survey annually in the Arctic region and effect engineering changes to make native MBES survey a core AOPV capability.

## **RECOMMENDATIONS**

13. The RCN should commit to supporting CHS in conducting modern hydrographic survey of the Arctic region. In order to ensure success in this endeavour the following is recommended:
  - a. Direct MARLANT and MARPAC to include Arctic hydrographic survey support into Arctic deployments including Op NANOOK and larger AOPV efforts. Before MBES is installed on AOPVs this will take the initial form of supporting CHS development of a continuous Arctic vertical datum and MCDV based survey using existing pole mounted MBES;
  - b. Direct the Director of Naval Requirements to initiate an engineering change which will add MBES capability to AOPVs with installation added to maintenance and refit periods following initial acceptance and deployment; and
  - c. Develop a MOU with CHS which formalizes a relationship in which the RCN supports CHS survey and is able to provide input to the prioritization of survey areas.

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