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## No-Space Days: Conducting Sustained Operations in a Denied Environment

Lieutenant-Commander Anonymous

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**NO-SPACE DAYS:  
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## **NO-SPACE DAYS:**

### **CONDUCTING SUSTAINED OPERATIONS IN A DENIED ENVIRONMENT**

#### **AIM**

1. This service paper will discuss the need for the Royal Canadian Navy (RCN) to further develop the capability of operating for extended periods of time in a Global Positioning System (GPS) or satellite-denied environment. While current naval doctrine and practice acknowledges the need for this skill set<sup>1</sup>, it is often exercised for a period of hours or a day, vice several days. A three to five-day practical exercise, involving all three currently serving warship platforms, Fleet staff, the Maritime Component Commander (MCC), and Regional Joint Operations Centre, would allow for a more fulsome assessment of any skill and knowledge gaps, as well as sufficient time to test various problem-solving strategies, and enable decision makers afloat and ashore to experience the operational environment without easily accessible, near real-time information.

#### **INTRODUCTION**

2. RCN warships' reliance on space-based technology for navigation, some weapons systems, and communications makes them particularly vulnerable to an attack that affects these satellites.<sup>2</sup> Secondary and sometimes tertiary systems and plans are in place in the event of losses of these capabilities, and teams ashore and onboard have excellent skills, experience, and capabilities to restore these functions as soon as possible. Combat Readiness Requirements (CRR) dealing with GPS denied environments and satellite communications failures are kept current, however, due to other training and operational priorities, these training outages typically last for hours vice days in accordance with the CRR's requirements<sup>3</sup>. However, a sustained loss of all satellite-dependent systems for several days in a row will stress the functionality and sustainability of these alternate methods, potentially exposing weaknesses that need correcting.

3. This service paper will examine RCN and Canadian Joint Operations Command (CJOC) doctrine, as well as Chinese and Russian capabilities, all at the unclassified level. It will also look at the potential benefits of, and challenges with, training for sustained operations in a denied environment, and some recommendations on training opportunities.

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<sup>1</sup> Canada, Department of National Defence, *CFCD 102: Maritime Command Combat Readiness and Training Requirements*, Ottawa: RCN.

<sup>2</sup> Canada, Department of National Defence, *Canada in a New Maritime World: Leadmark 2050*, Ottawa: Commander, Royal Canadian Navy, 2016, p. 54.

<sup>3</sup> CFCD 102

## DISCUSSION

4. Modern navies' inclusion of technology in all maritime capabilities has enabled power projection, global operations, and sustainability at levels not seen before<sup>4</sup>. Navigation systems use GPS to continually and accurately provide the ship's position within meters. Some weapons systems have a guidance system which may use GPS for accuracy. Communications systems use various methods including satellites to relay real time information to higher headquarters, port agencies, and friends and loved ones ashore, as well as allowing task groups to coordinate their actions.<sup>5</sup> However, this has created a reliance on technology to the point of dependence, thereby creating vulnerabilities that can be exploited.<sup>6</sup>

5. Tertiary systems and redundancies exist, along with the associated procedures, but are exercised for short periods of time, usually a few hours, unless there is a real-world problem<sup>7</sup>. In most of these exercises, these systems are proven correct, personnel are exposed to the equipment and procedures, and full capability is brought back on line. Some of these backups rely on older technology that is slower and cumbersome. Some require buy-in from shore establishments to assist or take extra steps and measures, or different procedures, for them to work. There are understandably competing priorities and other required tasks that are likely judged more important in the current situation and in the short term. There is a matter of risk involved with not using the most proven and preferred systems, which the crew is more familiar with and has the greatest expertise and training on.

6. However, as essential as safe navigation and communications are to the functioning of a warship, the opportune time to build skills and experience with redundant or tertiary equipment or processes is not when one of the systems fail. The attractiveness of training at one's own preferred time and space is clear, when the situation can be controlled, the risks managed, and the luxury of safety is afforded.

7. The likelihood of operating in an environment, against an adversary who can deny utilizing the space domain in a variety of ways, is increasing. "The most dangerous threats...[will be] exploiting security gaps most notably in the cyber and space domains."<sup>8</sup> Both Russia and China have various means of affecting both GPS and other satellite systems, from the civilian off the shelf GPS jammer, to very sophisticated military capabilities including surface-launched rockets and lasers to disrupt satellite functioning.<sup>9</sup>

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<sup>4</sup> Canada, Department of National Defence, *Royal Canadian Navy Strategic Lexicon*, Ottawa: Director General Naval Force Development, February 2022, p. 44.

<sup>5</sup> Leadmark 2050, pg 44.

<sup>6</sup> Canada, Department of National Defence, *How We Fight*, Ottawa: CJOC, p. 5.

<sup>7</sup> CFCD 102.

<sup>8</sup> How we fight, pg 5.

<sup>9</sup> Leadmark 2050 pg 30; Guillaume Lasconjarias, "NATO's Response to Russian A2/AD in the Baltic States: Going Beyond Conventional?," *Scandinavian Journal of Military Studies* no. 2(1): 74-83.

8. Besides having the requisite equipment and skills to achieve these effects, both of these nations may also have the will to use these capabilities against the North Atlantic Treaty Organization (NATO) and Five Eyes communities. There are ways of affecting the satellite systems without attribution to a particular state that would cause confusion and issues for the RCN and their partners<sup>10</sup>. Additionally, Russia is increasingly brazen in their use of weapons which the west would not consider. Their willingness to use chemical weapons and support Syria when they repeatedly used the same<sup>11</sup>, and President Putin's constant threat of low-yield nuclear weapons<sup>12</sup>, demonstrates just a few indicators of the different morality the Russian leaders are displaying. When coupled with the mounting tension between NATO and Russia over the Ukraine invasion<sup>13</sup>, a coordinated attack on multiple satellite systems is not out of the realm of possibility.

9. China has been more cautious in their display of capabilities and international rhetoric<sup>14</sup>. Indeed, on the surface their Treaty on the Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects indicates they will refrain from using anti-satellite weapons<sup>15</sup>. However, "Chinese analysts assess that the employment of space-based Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) capabilities by potential adversaries, especially the United States, requires the PLA to develop capabilities to attack space systems."<sup>16</sup> China has acquired and tested various instruments designed for satellite disruption, such as lasers and jammers, with an assessment that "Washington's over-reliance on satellites for C4ISR" makes the space-based assets a prime target.<sup>17</sup>

10. The American development of anti-satellite (ASAT) weaponry in the name of defence of North America and their interests, is a proven and known capability.<sup>18</sup> India, China and Russia all have demonstrated their ASAT prowess<sup>19</sup>. However, in an effort to 'engage the international community to uphold and strengthen a rules-based international order for space<sup>20</sup>' the US became the first space power to ban testing of ASAT weapons, which create a large amount of

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<sup>10</sup> Lasconjerias

<sup>11</sup> Kenneth D. Ward, "Syria, Russia, and the Global Chemical Weapons Crisis," *Arms Control Association*, (September 2021).

<sup>12</sup> Stephen Fidler and Michael R. Gordon, "Russia, China Challenge U.S.-Led World Order," *Dow Jones Institutional News*, (21 February 2023).

<sup>13</sup> *Ibid.*

<sup>14</sup> Shannon Tiezzi, "China Continues to Play Both Sides in the Ukraine War," *The Diplomat*, (23 February 2023).

<sup>15</sup> Bradley Bowman, "Russia and China Seek to Tie America's Hands in Space," *Foreign Policy*, (31 March 2021).

<sup>16</sup> Harsh Vasani, "How China Is Weaponizing Outer Space," *The Diplomat*, (19 January 2017).

<sup>17</sup> *Ibid.*

<sup>18</sup> Daryl G. Kimball, "US Commits to ASAT Ban," *Arms Control Association*, (May 2022).

<sup>19</sup> *Ibid.*

<sup>20</sup> *Ibid.*

space debris<sup>21</sup>. Even so, China cannot be expected to sit idly by while their arch rival possesses a capability for satellite disruption.<sup>22</sup>

11. Disruption of satellites and associated systems would cause such large-scale chaos for both military and civilian populations, that one could argue just the mere threat of such capability is enough for deterrence, that China possesses the means but not the will to exercise those means. However, in the uncertainty surrounding how the conflict for Taiwan will play out between China and the US and their partners, the possibility of China using widespread space denial cannot be discounted or de-prioritized<sup>23</sup>.

12. There are several CRRs related to GPS-denied environments and cyber-attacks, however the time requirement for each is 90 minutes to three hours, valid for half a year to a year<sup>24</sup>. Given the number of CRRs and additional training requirements the ships all have, plus other priorities with time commitments, it is understandable that the CRR time requirements are not any longer<sup>25</sup>. CRRs need to be achievable within the compressed timelines of a tiered readiness program, especially ones that require the ship to be at sea to complete, or require an outside organization for validation, such as someone from sea training<sup>26</sup>. There are also the challenges and constraints imposed by real-world geography and weather, in that the real-world risk to the ships may be greater than the benefit of the serial.

13. That being said, an exercise period of a few hours is not enough to truly stress the system. One training possibility would be to have several ships together at sea for a few days, simulating a denied environment, and working with the associated teams ashore by practicing with the alternate equipment, processes, and procedures that would be used in the event of a real, days-long requirement to operate in a such an environment. Days simulating no space access, whether GPS denial, communications satellite outage, or a combination, working with the tertiary or backup processes will expose weaknesses in the equipment, procedures, or skill sets of both the ship and shore teams. It will better demonstrate the true sustainability of the backup system.

14. Operating in this environment for a longer period than a few hours will allow more people to have true exposure to and experience with these processes, encouraging not just the acquiring of new skills, but also pushing innovation and unique problem solving from those involved. The true nature of operating with different processes and systems will provide a look at the human cost as well, including time requirements, which operational priorities can be and need to be maintained, as well as personal skill sets and training and experience gaps.

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<sup>21</sup> *Ibid.*

<sup>22</sup> Ben Blanchard, "China Putting U.S. Space Assets at Risk, Senior U.S. Officer Says," *Reuters*, (08 December 2022).

<sup>23</sup> Fabian-Lucas Romero Meraner, "China's Anti-Access/Area-Denial Strategy," *The Defence Horizon Journal*, (09 February 2023).

<sup>24</sup> CFCD 102

<sup>25</sup> CFCD 102

<sup>26</sup> CFCD 102

15. An exercise of this nature should involve shore teams, both technical teams, and higher headquarters in Fleet and MCC, as well as the ships, providing the team members and Command with the demonstrated proof of concept, and associated confidence that the processes will work when needed. A training exercise of this nature would allow decision makers both afloat and ashore to be immersed in a different decision-making space than usual, one where limited information is available, and yet operational imperative must be met<sup>27</sup>. It would also provide a realistic picture of what is possible within a given time and space.

16. Within the exercise context, the purpose is to fully test the alternative methods of navigation, communications, and combat. The teams would be driven to demonstrate the same capacities as with primary capabilities, as opposed to giving up because the system is down. Certainly, near the end of the exercise, personnel will be permitted to fight to regain their full capabilities as soon as possible, as they would in a real situation. Once personnel have experienced the challenges of this denied environment, they may have more motivation in the future to rectify issues.

17. As discussed in RCN, and CJOC guidance and doctrine, the future of warfare is pan-domain,<sup>28</sup> and the CAF's role is a contribution to Allied and partner operations<sup>29</sup>. The RCN Strategic Lexicon states that Canada's leaders have viewed the RCN's role in part "to contribute to coalitions of like-minded allies and partners that seek to uphold the international order."<sup>30</sup> To meet these requirements, the RCN regularly works with Allied and partnered navies and coast guards, as well as the other CAF services, focusing on building interoperability skill sets to make any future transition to combat and other operations more seamless. The CAF as a whole needs to keep pace with the changes our allies are making to "evolve their capabilities and processes in a way that ... allows them to compete with adversaries across multiple domains."<sup>31</sup> While this includes integrating new technologies, it also needs to include how to sustain operations when these technologies fail.

18. The Royal Canadian Air Force (RCAF) and Canadian Army (CA) also practice operating in a denied environment on a regular basis. In order to be more wholly prepared for pan-domain operations in a denied environment, the exercise could conceivably grow to incorporate the other services. Additionally, as outlined in Strong, Secure, Engaged, "Canada requires a Navy... to project power responsively and effectively far from Canada's shores."<sup>32</sup> The RCN is thus expeditionary on a global scale, utilizing all warship platforms to meet its commitments. Therefore, it would be ideal to exercise with allies as well, specifically Five Eyes partners and close NATO allies, once the RCN was confident in this capability. NATO has stressed

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<sup>27</sup> Leadmark 2050, p. 44.

<sup>28</sup> Canada. Department of National Defence. *Pan-Domain Force Employment Concept: Prevailing in an Uncertain World*. Ottawa: CJOC, 2022.

<sup>29</sup> How We Fight, p. 6.

<sup>30</sup> *Ibid.*, p. 8.

<sup>31</sup> *Ibid.*

<sup>32</sup> *Ibid.*, p. 34.

“exquisite platforms are highly dependent on vulnerable networked information, particularly delivered by space-based capabilities... denial of satellite connectivity would degrade the ability to conduct precision warfare.”<sup>33</sup> One of the CAF’s strengths it offers to its allies is “almost complete interoperability,”<sup>34</sup> something that needs to be maintained regardless of the operating environment.

## CONCLUSION

19. In conclusion, this service paper has discussed building a more robust capability to operate in a denied environment through a multi-day exercise, incorporating all three currently serving RCN warship platforms and the associated technical and headquarters staff ashore. Stressing the systems and processes that would be used in the event of an actual need to operate in a space denied environment for longer than a few hours will more readily expose any weaknesses in processes, knowledge and experience gaps, and equipment limitations. It would also allow decision makers at various levels to fully experience these operations. In addition to building confidence that the processes are fully experienced within the RCN, fully exercising this type of operation with Five Eyes and NATO partners would add to Canada’s contribution to our allies. And involving the RCAF and CA would ensure a closer to pan-domain capability was being developed.

## RECOMMENDATIONS

20. Exercise the RCN’s capability to operate in a denied environment for three to five days, incorporating all three current warship platforms as well as shore based technical authorities and fleet and operational headquarters staff. Build upon this exercise to include the other services in a pan-domain environment, as well as Five Eyes and NATO partners to ensure full interoperability during operations.

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<sup>33</sup> NATO, Ministry of Defence, *Allied Joint Doctrine (AJP-01)*, Ed. F, V. 1. London: last update 12 January, 2023, p. 67.

<sup>34</sup> *How We Fight*, p. 9.



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