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POTENTIAL USE OF ARTIFICIAL INTELLIGENCE WITHIN THE MILITARY INTELLIGENCE CYCLE

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POTENTIAL USE OF ARTIFICIAL INTELLIGENCE WITHIN THE MILITARY INTELLIGENCE CYCLE

AIM

1. This paper is directed at the Canadian Forces Intelligence Command (CFINTCOM). The aim is to explore the potential of artificial intelligence (AI) in transforming the intelligence cycle into a more effective means of processing data and information into relevant and actionable intelligence. Specifically, the paper will explore how the Department of National Defence (DND) and the Canadian Armed Forces (FAC) can best optimize the use of AI within the four cyclical stages of intelligence; direction, collection, processing and dissemination.[1]

INTRODUCTION

2. During the 20th century, it has been common for military innovations to find applications in the civilian world. Military advances from World War II, such as radar and jet engines shaped the future of civilian aviation for decades thereafter. Rocket engines had a similar impact, allowing for space exploration and eventually space applications. During the Cold War, applied defence research in networking and geo-localization led to the birth of two systems now widely used by civilians; the internet and the Global Positioning System (GPS).[2] As demonstrated, innovation and technology are transferable across domains. Now, in a time where AI innovations are most likely to be driven by civilian stakeholders, due to their higher level of investment, the military needs to leverage this well of scientific discovery in order to remain technologically relevant and improve its processes.[3]

3. AI appears as a very promising avenue to provide efficiency, speed, accuracy, and cost savings to the military.[4] However, one of the main issues with AI is the relative opacity or ambiguous nature of the concept. Therefore, in order to frame the discussion, the section below will begin with a definition of AI and an overview of its current applications in different sectors. Following this initial look at the concept, its potential utility in improving the different stages of the intelligence cycle will be explored. This will be achieved through a series of examples illustrating how AI can fit into the different stages of the cycle, but also some potential ethical and legal implications of such an enterprise. This exercise will lead to a short conclusion and a recommendation based on the findings of the paper.

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[1] Department of National Defence, B-GA-401-002/FP-001, *Royal Canadian Air Force Doctrine: Intelligence, Surveillance and Reconnaissance* (Ottawa: DND Canada, 2017), 4-1.

[2] Pocket-lint, “28 Ways Military Tech Changed Our Lives,” last modified 31 May 2019, https://www.pocket-lint.com/gadgets/news/143526-how-military-tech-changed-our-lives.

[3] M.L. Cummings, *Artificial Intelligence and the Future of Warfare,* Research Paper (London: Chatam House - The Royal Institute of International Affairs, 2017), 10.

[4] Daniel S. Hoadley and Nathan J. Lucas, *Artificial Intelligence and National Security,* Congressional Research Service Report for Members and Committees of Congress (Washington: Congressional Research Service, 2018), 36.

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DISCUSSION

4. Currently, AI is mostly defined by Artificial Narrow Intelligence (ANI) which means that AI-enabled systems can function at or above human levels, but only within a band of predetermined and specific tasks. From a theoretical perspective, ANI exist in opposition to Artificial General Intelligence (AGI), which represents the capacity of AI to effectively perform the full range of human tasks, and Artificial Super-Intelligence (ASI) where machine intelligence finally exceeds human capacity at any task.[5] Based on the current pace of development in computing and software, ASI still represents a distant future possibility. However, according to optimistic expert predictions, high-level machine intelligence in the form of AGI could become a reality as early as 2040, within the career window of some of our current CAF members.[6] That said, for the purpose of this paper, which is looking at current issues, the focus will remain on ANI and its applications. In this context, AI is understood as a set of existing or developing technologies that allow machines to match or exceed human capacity in performing complex assignments.[7]

5. Michael C. Horowitz, an associate professor of political science at the University of Pennsylvania, mentions the following with regard to the military applications of AI:

> The potential promise of AI—including its ability to improve the speed and accuracy of everything from logistics to battlefield planning and to help improve human decision-making—is driving militaries around the world to accelerate their research into and development of AI applications.[8]

6. Despite this trend, however, defence investments in AI only represent a small fraction of the global investment in the field by civilian institutions and corporate giants such as Google, Amazon, Facebook and Apple.[9] That being said, because these companies and others invest massively in AI research pertaining to autonomous systems, information and communication, it can be argued that there is a strong convergence between the type of problems they are addressing and those affecting the military in trying to gain accuracy, speed and efficiency, for example in the intelligence cycle. Simply put, in the Information Age, one of the biggest challenge affecting all organizations, civilian or military, is information overload. This is the problem of Big

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[5] Stephan De Spiegeleire, Matthijs Maas, and Tim Sweijs, *Artificial Intelligence and the Future of Defense: Strategic Implications for Small and Medium Sized Force Providers* (The Hague: The Hague Centre for Strategic Studies, 2017), 30.

[6] Vincent C. Müller and Nick Bostrom, "Future Progress in Artificial Intelligence: A Survey of Expert Opinion," in *Fundamental Issues of Artificial Intelligence,* ed. V. C. Müller (Berlin: Springer, 2016), 553.

[7] Larry Lewis, *Insights for the Third Offset: Addressing Challenges of Autonomy and Artificial Intelligence in Military Operations* (Arlington: US DoD, 2017), iii.

[8] Michael C. Horowitz, "The Promise and Peril of Military Application of Artificial Intelligence," *Bulletin of the Atomic Scientists,* last modified 23 April 2018, https://thebulletin.org/2018/04/the-promise-and-peril-of-military-applications-of-artificial-intelligence/.

[9] Cummings, *Artificial Intelligence and the Future of Warfare . . .,* 10.

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Data (BD) processing.[10] Therefore, if there is one domain where AI can be relevant for the military, it is certainly the domain of information management.

7. There is currently a wide range of actors in different sectors involved in AI. This allows for a survey of current applications. Bernard Marr, who is a Forbes contributor, provides a series of interesting examples. Watson, IBM's machine learning system, was able to infer Gaudi's influences after being fed hundreds of images of the artist's work and other complementary material. In turn, the machine was able to inspire a group of human artists in reproducing his style in a sculpture. In China, Infervision was developed to mitigate a shortage of radiology specialists. Each year, the application reviews over a billion CT scans looking for early signs of cancer. Not prone to human fatigue and errors, the system augments the work of radiologists and allows them to produce more accurate diagnoses.[11]

8. In the UK, Press Association (a news agency) partnered with Urbs Media (a news automation specialist) in an effort to save local news. Through their RADAR project, which fuses information from different official and reliable sources, they enabled robots to autonomously write 30,000 local news stories every month, hence filling a widening gap in traditional media coverage. Of course, as an AI pioneer, Google also provides us with different examples of AI applications. The company, as early as 2011, was successful in leveraging deep learning for image recognition through its Google Brain project. More recently, combining cloud computing, geo-mapping and machine learning, Google launched the Global Fishing Watch. This project allows machines to assess the likely purpose of vessels at sea and therefore identify illegal fishing activities.[12] Keeping these examples in mind, the question that follows is how the technology behind such initiatives can transform the intelligence cycle into a more effective means of processing data to produce intelligence?

9. As per Canadian doctrine, "The output of the [intelligence cycle] process is actionable information that enables decision making at all levels of command."[13] This critical enabling cycle is comprised of four stages. Direction provides focus to tactical and operational collectors through the development and maintenance of the overall Intelligence Collection Plan (ICP). Collection, the actual data gathering stage, is enabled through the Intelligence, Surveillance and Reconnaissance (ISR) matrix which provides refined guidance and priorities to collectors. Processing, the fusion and analysis of all-source intelligence in order to produce actionable findings, represents the stage were reports are produced. Finally, dissemination is the process of distributing intelligence

[10] Big Data represents "data sets, typically consisting of billions or trillions or records, that are so vast and complex that they require new and powerful computational resources to process." Dictonary.com, last accessed 26 October 2019, https://dictionary.com/browse/big-data.

[11] Barnard Marr, "27 Incredible Examples of AI and Machine Learning in Practice," *Forbes,* last modified 30 April 2018, https://www.forbes.com/sites/bernardmarr/2018/04/30/27-incredible-examples-of-ai-and-machine-learning-in-practice/#4688ac7b7502.

[12] *Ibid*.

[13] Department of National Defence, *Royal Canadian Air Force Doctrine . . .,* 4-1.

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reports and providing briefs to relevant commanders and stakeholders.[14] Potential AI applications for each stage will now be explored.

10. **Direction.** Closely linked to the military function of Command, and therefore to the notion of commander's intent, this stage is probably less likely to be transformed by AI in the short term. Based on current technology, this stage should remain the most human of all for the foreseeable future. This is due to the limitations of ANI which, by definition, is focused on a narrow set of problem-solving abilities. Without the reflection capacity of the human brain, machines still lack the judgment required to fully assess complex scenarios and understand their intricacies. AI can produced extremely creative solutions to problems, like a computer trained to play Tetris did when it thought itself to pause the game every time it was about to lose, but "This adaptation by the AI reflects behavioral uncertainty beyond what most militaries would tolerate."[15] As a consequence, it would be prudent, at this juncture, to look for potential AI applications in the other stages of the intelligence cycle.

11. **Collection.** Through AI, the intelligence collection stage can gain in efficiency, accuracy, force protection and cost-savings. For example, Russia has been using unmanned ground vehicles to collect intelligence in Syria. Israel, similarly, uses a fleet of self-driving vehicle to patrol and gain awareness on activities along the Gaza Strip borders.[16] This represents a proven concept in which DND/CAF should invest. In the more distant future, the prospect of AI augmented human soldiers ". . . with enhanced capabilities that improve their ability to sense their environment, make sense of [it], and interact with one another, as well as with 'unenhanced humans,' automated processes, and machines of various kinds"[17] will also create enormous potential in terms of intelligence collection. This is an avenue to pursue in order to apply the notion that 'every soldier is a sensor' in the long run.

12. Another avenue for DND/CAF to enhance collection would be to exploit the possible synergy between existing technologies such as cloud computing, geo-mapping and machine learning. Such an effort would be aimed at reproducing what Google did with its Global Fishing Watch project, but for different problem sets. For example, geo-tracking enemy units or terrorists while analysing their interactions with other individuals and entities could provide insights as per their probable intent and course of action. This approach could also be applied domestically in predicting the consequences of natural disasters and the associated population movements. However, there are multiple legal, ethical and privacy issues linked to this approach. These would require significant consultations and policy work. Even more problematic is the fact that DND and CAF do not possess the resources to implement such a model on their own. Therefore, partnering with private corporations would be the only way to operationalize this form of enhanced

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[14] Louis-Henri Rémillard, "The 'All-Source' Way of Doing Business: The Evolution of Intelligence in Modern Military Operations," *Canadian Military Journal* 8, no. 3 (Autumn 2007): 23.

[15] Horowitz, "The Promise and Peril of Military Application of Artificial Intelligence."

[16] De Spiegeleire *et al., Artificial Intelligence and the Future of Defense . . .,* 82.

[17] Alexander Kott *et al., Visualizing the Tactical Ground Battlefield in the Year 2050: Workshop Report* (Adelphi, MD: US Army Research Laboratory, 2015), 7-8.

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collection. Then again, because of the sensitive nature of intelligence, this partnership would likely create significant political and contractual frictions. Furthermore, "Google has long distanced itself from military contracts, while also acquiring highly advanced robotics companies and letting these companies' pre-existing military contracts expire."[18] In this context, such a model of highly integrated intelligence collection will remain aspirational for DND/CAF. That said, the military should still pursue its efforts to optimize the intelligence fusion model that is already in place and which is epitomized by all-source intelligence organizations.[19]

13. **Processing.** Beside the most obvious and often discussed ways to improve military processes through AI, such as real-time information processing[20], BD and imagery analytics,[21] and enhanced war-gaming,[22] there is a potential for Canada to innovate by looking at AI industry leaders to improve its defence intelligence processing capabilities. For example, CFINTCOM could find inspiration in the RADAR project to create a federated intelligence production network that leverages the work of its geographically dispersed analysts. In this model, intelligence analysts would represent the trusted sources that feed an AI system in charge of fusing the information and producing actionable intelligence. The result would then be redistributed across the network, linking together different individuals that may each possess a small portion of the answer to a bigger problem. Another avenue would be to develop an AI niche, such as that of Infervision for cancer detection, but in the realm of intelligence. Perhaps, an AI-enabled regional stability projection tool would become quite useful for both Canada and its allies.

14. **Dissemination.** Even the best intelligence has no real value if it does not reach the intended audience in time to enable proper decision-making. Dissemination is essential to the intelligence cycle. Since recommendation systems and targeted advertisement algorithms already exist in the corporate world, an easy way to gain speed, accuracy and cost savings with dissemination would be to adapt and import such algorithms to the military classified systems used by intelligence operatives.[23] The idea would be that, based on the research, production, communication and reading habits of an intelligence specialist, products, contacts or activities would be proposed by the software. This would foster professional networking and synergy within the intelligence community. Here is a relatively simple solution with a lot of potential that could be implemented almost immediately.

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[18] Cummings, *Artificial Intelligence and the Future of Warfare* . . ., 11.

[19] Rémillard, "The 'All-Source' Way of Doing Business . . .," 25-26.

[20] Alexander Kott *et al., Visualizing the Tactical Ground Battlefield in the Year 2050 . . ., 16.*

[21] Cheryl Pellerin, "Project Maven to Deploy Computer Algorithms to War Zone by Year's End," *DoD News,* last modified 21 July 2017, https://www.defense.gov/Newsroom/News/Article/Article/1254719/project-maven-to-deploy-computer-algorithms-to-war-zone-by-years-end/.

[22] Bil Hallaq *et al.,* "Artificial Intelligence within the Military Domain and Cyber Warfare," *Proceedings of the 16th European Conference on Cyber Warfare and Security,* (Dublin: Academic Conferences and Publishing International Limited, 2017), 154.

[23] De Spiegeleire *et al., Artificial Intelligence and the Future of Defense . . .,* 45.

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CONCLUSION

15. AI offers of lot of opportunities to military leaders in terms of information management. Furthermore, ANI only represents the tip of important revolution to come. However, AI innovations mostly occur outside of the military. In this context, military planners who wish to use AI to improve the intelligence cycle have to look at the corporate world for inspiration. This is the path followed here and the exercise led to the identification of a few ideas that could be implemented in the short term. More importantly, the paper demonstrated that the reflection on AI needs to occur now. By not being in the lead, the military is already behind.

RECOMMENDATION

16. CFINTCOM and the wider DND/CAF intelligence community should devise a deliberate effort to remain current with AI developments and reflect on military applications. While developing a full range of in-house capabilities may appear as an ideal solution, this course of action is restricted by available resources. Joint ventures with the private sector may also be appealing, but this option is limited by a series of financial, legal, ethical and policy-related constraints. Therefore, it is recommended that CFINTCOM conducts annual seminars on AI in order to develop hybrid solutions that are both leveraging the innovative features of AI and answering its requirement for a more efficient intelligence cycle.

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