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LEVERAGING ARTIFICIAL INTELLIGENCE TO SUPPORT LAND OPERATIONS

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AIM

1. The motivation behind this paper is that technological advancement is shaping the future battlefield. Wars that were fought towards the end of 20th and early 21st century witnessed how technology can offer tactical advantages to those using it. The trend of technological reliance on the battlefield will not reverse, rather forces have to adopt and exploit technology if they are to remain relevant to the current and future war fighting. Being in the Information Age (IA), future battlefields will therefore be infested by great technological applications. Artificial Intelligence (AI) provided a remarkable force multiplier on the battlefield and will complicate the war fighting to the forces that don't timely embrace it. This paper will highlight the how IA will impact future operations of the land forces.

INTRODUCTION

2. Technological developments in AI and automation are continuously causing new military capabilities to develop. Effects caused by the evolution in AI and robotics can be felt across spectrum of all the operational functions. The approach to the operational functions which include: Command, Sense, Act, Shield and Sustain will all be affected. This will therefore call for a change in implementing these operational functions. Nations and militaries that fail to adapt to and exploit AI will face natural extinction as they will not be relevant to fighting methodologies of the time. Considering the fact that AI has come to the field of national security; it is here to stay. It therefore becomes imperative that the Canadian Armed Forces (CAF), the Canadian Army (CA) specifically; exploit and embrace the advantages offered by AI.¹

DISCUSSION

Understanding AI

3. AI should be understood as use of robotics, machinery, computer systems or their combination to perform activities which were initially thought to only be solved by human thinking. AI technology has resulted in the production of technologies that perform complicated assignments beyond human capacity.² AI can thus be exploited as a useful operational enabler. AI increases the rate of activities on the fluid battlefield. Accuracy is improved starting from the planning through to execution and further to Battle Damage Assessment (BDA). AI allows weapon systems to operate without a human operator. In plain language; AI increases force effectiveness and capabilities of standoff force projection. These AI prospects have driven global military powers to consider fast tracking research, development and incorporation of AI into their folds. This basically entails that AI be integrated into all the operational functions.

Adaptive Dispersed Operations

¹ Michael C. Horowitz. "The promise and peril of military applications of artificial intelligence" *Bulletin of The Atomic Scientists* (April 23, 2018) accessed online https://thebulletin.org/landing_article/the-promise-and-peril-of-military-applications-of-artificial-intelligence/ on 08 October 2018.

² Larry Lewis. *Insights for the Third Offset: Addressing Challenges of Autonomy and Artificial Intelligence in Military Operations* (Arlington, USDOD, September 2017), iii.

4. CA envisages future warfare to involve Adaptive Dispersed Operations (ADO). The idea foresees a battlefield which is fluid, multi domain warfare requiring adaptive, agile and dispersed military operations. ADO entail CA widely dispersing in time and space, demanding speedy decision making processes and network centric operations. ADO cannot be achieved without embracing AI applications and systems.³

5. According to ADO concepts, Command demand leaders to be conversant with the nature of the future battlefield and maximize use of technological assets availed to them. Information Technology (IT) enables command to compress time and space, thus liquefying the battlefield. With regard to Sense, Act and Shield; the ADO environment expects the integration of these functions to enhance agility. ADO will maximize technology within Sustainment in order to support small dispersed teams which overwhelm ground echelon systems.⁴ AI hence influences all the CA operational functions.

Command

6. Command Posts (CP) of strategic, operational and tactical commanders are continuously flooded with information. If not well managed, the information is likely to overwhelm processing capacity at the CPs leading to information overload. Information overload will lead to either delays in making decisions or contribute to wrong decisions. AI algorithms are developed to assist staff in organising, storage and management of information. The tools of AI are likely to assist in analysing the data to support informed decisions. Using AI applications to analyse data provides a considerable speed to reach the interpretation process. In simple terms, the Observe, Orientate, Decide, Act (OODA) loop is hastened.⁵ Other militaries have already started to incorporate AI in their processing of information to make decisions as exemplified below:

- a. Head of Intelligence for French Military disclosed that they are using AI to quickly analyse classified information for making decisions on military operations.⁶
- b. In 2012, the Royal Netherlands Army (RNLA) used an AI package produced by an Israeli firm to train their command and staff. The package could handle both low and high intensity operations including Operations Other Than War (OOTW).
- c. Additionally, China Peoples Liberation Army (PLA) has taken strides in command and control of Unmanned Aerial Vehicles (UAVs) using AI after establishing a group called Intelligent Systems and Systems of Systems Science and Technology Domain Expert Group.⁷

³ Andrew B. Godefroy (ed). *Land Operations 2021: Adaptive Dispersed Operations: A Force Employment Concept for Canada's Army of Tomorrow* (Kingston, Ont: Directorate of Land Concepts and Doctrine, DND Canada. 2007), 16-18.

⁴ Ibid, 27.

⁵ Michael C. Horowitz. "The promise and peril of military applications of artificial intelligence" *Bulletin of The Atomic Scientists* ...

⁶ Ibid.

⁷ Stephan De Spiegeleire et al. *Artificial Intelligence and the Future of Defense: Strategic Implications for Small- And Medium-Sized Force Providers*. (Hague: The Hague Centre for Strategic Studies, 2017), 79-80.

7. Experience has shown that AI systems using algorithmic targeting capability can drastically reduce process of the targeting cycle. Increased speed within the targeting cycle may translate to flexibility and versatility of the operational staff and increase accuracy of the weapon systems. Due to increased independence of the systems, gaps in communication do not directly affect the rhythm of activity on the battlefield.

8. As technology revolutionises, the means of information sharing also evolves affecting the means of control. AI platforms become very useful to share information thereby altering the hierarchical structure of command and control.⁸ Unlike the industrial age, information sharing in the information age can be done by the touch of the screen. Due to these technological advancements, prosecution of future wars rely on networks referred to as “Network Centric Warfare” (NCW). NCW requires flexible sharing of information and equal situational awareness. AI is the only means of ensuring equal situational awareness over widely dispersed land forces in the ADO. This can allow CA to be an information edge organisation fitting into the future battlefield.

9. Training is a command function; AI can be used to train the staff in terms of staff planning tasks up to wargaming. Command in the AI environment changes as it becomes a shared venture not for a single individual.⁹

Sense

10. AI continues to be an important element in the sense function. AI allows an integration of applications in information collection, processing, exploitation and dissemination. Israel is already exploiting AI using self-driving vehicles as sensor to patrol borders of the Gaza Strip. On the other hand, the Russian Federation is using the Unmanned Ground Vehicles (UVGs) as sensors in Syria.¹⁰

Act

11. Enhanced OODA loop allows agility and ability to attack the enemy with speed hence achieving surprise. Speed offers a marked advantage in modern warfare. Use of AI systems permit for timely fire support to land forces because the requirement to protect human operators will be removed. With human operators, speed and manoeuvre are controlled. Striking autonomous AI systems increase flexibility as there is no element of being overwhelmed as may be faced by human operators.

12. Other AI systems can detect, track and engage targets without human interaction. This means AI systems can be deployed autonomously armed with lethal weapons to produce the required effects. A quick example of this possibility is the Russian Drone Tank, Uran-9 which is claimed to have performed to perfection in Syria. AI therefore allows hands off continuity of targeting operations. Israelis claim that their Harpy anti-radiation UAV is capable of sensing and

⁸ David S Alberts and Richard Hayes. *Power to the Edge: Command and Control in the Information Age* (Washington: USDOD, 2005), 74.

⁹ Ibid.

¹⁰ Stephan De Spiegeleire et al. *Artificial Intelligence and the Future of Defense: Strategic Implications for Small- And Medium-Sized Force Providers...*, 82.

striking independently. They are planning in the near to produce units with combinations of humans and robots to enhance efficiency. They are also in the advanced stages of arming the self-driving vehicles so that they can combine sensing and striking.¹¹

13. In operations of extended duration, there might be a requirement to rotate the troops. This activity might be time consuming; requiring operational pause or reduced intensity of action. This is however not the case with autonomous AI systems that can operate continuously. AI reduces collateral damage as exemplified by the smart munitions. AI systems armed with smart munitions are the ultimate weapon for the future battlefield. In limited wars, AI allows regimes to act against an adversary without any commitment to fully fledged war.¹²

Shield

14. AI systems are capable of operating alone without human interaction. Thus they can independently be deployed deep into enemy territories and operate. This capability reduces the risk to human soldiers required to execute these types of missions. For example, special forces are at times required to go deep behind the enemy lines for deep operations, autonomous AI systems can produce the same effects thereby reducing the risk of exposure to special forces. Robots can even venture into battlefield where threats of Nuclear Biological Chemical (NBC) and mine warfare threats are high. An example is the Russian Uran-6 Robots deployed in Syria and was successful in demining and disarming booby traps.¹³ Once captured, a robot can be programmed to self-destroy all necessary parts, thus denying intelligence to the enemy.¹⁴ AI therefore reduces the human exposure to extremely dangerous battlefield environments.

15. AI can also be used to interact with humans in order to enhance their abilities on the battlefield. The Tactical Assault Light Operator Suits (TALOS) which are under development by the United States Special Operations Forces (USSOF) will enhance mobility and load capacity of the light infantry forces; thus increasing their effectiveness and reducing the chances of culmination on the battle field.¹⁵ AI will also enable Air Defence systems like the Patriot and the Terminal High Altitude Air Defence (THAAD) to communicate and exchange targets for autonomous strike.¹⁶ This provides a continuous and coordinated air defence to the land forces. Shield will be an integration of human and AI systems to ensure force protection and freedom of action.

Sustain

¹¹ Stephan De Spiegeleire et al. *Artificial Intelligence and the Future of Defense: Strategic Implications for Small- And Medium-Sized Force Providers...*, 79-80.

¹² Ibid, 79-80.

¹³ Ibid, 79-80.

¹⁴ J. Khurshid. *Military Robots: A Glimpse from today and tomorrow*. (Kunming: ICARCV, 2004) IEEEExplore Digital Library online. <https://ieeexplore.ieee.org/abstract/document/1468925> accessed on 09 October 2018.

¹⁵ Vivienne Machi. "Iron Man Suit On Track, But Hurdles Remain". National Defense Magazine. (22 May 2017). <http://www.nationaldefensemagazine.org/articles/2017/5/22/iron-man-suit-on-track-but-hurdles-remain> accessed on 14 October 2018.

¹⁶ Jen Judson. "So Patriot and THAAD will talk. What does that really mean?" *Defence News*, <https://www.defensenews.com/digital-show-dailies/ausa/2018/10/10/so-patriot-and-thaad-will-talk-what-does-that-really-mean/> accessed on 10 October 2018.

16. The need to rotate the troops or conducting relief operations drastically reduces as AI platforms operate continuously; thereby reducing transport requirements. Furthermore, overdependence on human labour reduces as machines take over, thus offsetting need for high recruitment and retention. Conversely, AI demands increased soldier technical training, while logistical requirements landscape call for additional technical maintenance resources. Militaries reduce their reliance on people by allowing them to operate in field of industrial productivity. When the need arises, there can be mass production of the robots to support the war effort. This means future chances of conscription are reduced as AI platforms fill the force deficits.

17. During force generation phase of operations, there will be less logistics requirement as compared to those required when generating human soldiers. Robot soldiers can be stored for long durations with fewer requirements for upkeep compared to generating human soldiers. Robots will neither require boots and uniforms allowances nor compensations when killed in action. Thus reducing the cost of war.

18. It is impossible to train people to exactly the same level of technical skills. This is because individuals are born with different capacities, different intelligence quotient and physical abilities. In the case of robots, it is easy duplicate robots of exactly the same level of intelligence, making them cheap and easy to replacement. Again, as teams are scattered on the ADO battlefield, ground transport and echelon systems will not satisfy logistic requirements. AI systems are capable of carrying out precision air drops of supplies even in inaccessible and hostile areas.¹⁷

Tactical Implications

19. The advantage of the AI is that it multiplies the speed of activity on the battlefield in all domains. This implies using algorithmic applications in analysing information for making decision and employing AI mobile systems for operations. AI systems are capable of achieving the effects as may be desired by the commander. Achieving the concept of ADO within the CA can only be possible if AI capabilities are exploited. However, in the case of network warfare, an attack on the data drive could be disastrous. Comprehensive cyber security will therefore be a key priority. Duplication of systems helps to mitigate effects of a network attack.

20. AI requires complex and fragile software and hardware. This fragility renders them susceptible to destruction. The robots are also often designed for specific tasks. This reduces the flexibility in tasking to commanders. For instance, an AI system designed for mine clearance cannot be tasked to collect information, while human combat engineers doing the same task can act as human sensors. Again, some operations for example counterinsurgency operations, the centre of gravity is the local population, it becomes very difficult for the robots to interact with the populations and win their hearts and minds.

Legal and Ethical Implications

21. The use of autonomous robot on the battlefields has been criticised especially on the grounds of delegating targeting to the automated process. Meaning that the machines have to

¹⁷ Andrew B. Godefroy (ed). *Land Operations 2021: Adaptive Dispersed Operations: A Force Employment Concept for Canada's Army of Tomorrow...*, 31.

decide what and how to attack. This erodes the human responsibility and accountability in the field of Laws of Armed Conflict (LOAC). How the laws that were meant to be applicable to humans may be applied on machines remains a dilemma. There are also issues of the possibility of hacking the AI systems. Once hacked, the culprits can deliberately use them for terror acts or due to lack of expertise may end up causing accidents that may cost human lives.¹⁸

22. Deploying lethal AI systems as argued by the International Committee of the Red Cross (ICRC), will lead to loss of humanity in the execution of wars. The point is that regardless of any future advances in technology, machines will not be able to respect “Humanity” as a principle of LOAC.¹⁹ The development of AI systems is therefore being resisted. On the other hand, proponents of AI are sure that the new automated AI systems combined with smart technology will reduce collateral damage and loss of civilian lives.²⁰

CONCLUSION

23. The future of land operations requires ADO, this call for capabilities that can enhance agility, timely dispersion of adaptive and multipurpose forces in time and space. For this to materialise the forces must be networked and be responsive to the changes on the battlefield. Unless CA starts to gradually incorporate AI in the training and operations, ADO will remain to be a dream. As discussed, AI enhances speed, effectiveness, efficiency and accuracy in all the operational functions. AI will shape the battlefield in the coming decades hence the need to embrace the technology timely just like other armed forces of the world are doing. ADO requires AI.

RECOMMENDATION

24. With the forecast developments on the operating environments and to be a useful member of future coalitions, the following recommendations should be considered:

- a. The CA should devise deliberate effort to start developing AI capabilities in order to be relevant with the future operating environment.
- b. CA should consider venturing into a joint venture with other friendly militaries to invest in the research of AI.
- c. CA should consider contracting private technology companies to propose a possible venture into AI for military purposes.

¹⁸ Peter Asaro. “Why the world needs to regulate autonomous weapons, and soon” *Bulletin of the Atomic Scientists* (April 27, 2018) online, https://thebulletin.org/landing_article/why-the-world-needs-to-regulate-autonomous-weapons-and-soon/.

¹⁹ Kenneth Anderson and Matthew C. Waxman. “Debating Autonomous Weapon Systems, their Ethics, and their Regulation under International Law”. In *The Oxford Handbook of Law, Regulation and Technology*. (Oxford: Oxford University Press, 2017). 1104-1105.

²⁰ Peter Asaro. “Why the world needs to regulate autonomous weapons, and soon” *Bulletin of the Atomic Scientists* (April 27, 2018)

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