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# DIGITIZING GROUND FORCES FOR HIGHER OPERATIONAL READINESS

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**JCSP 44**

***Exercise Solo Flight***

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**DIGITIZING GROUND FORCES FOR HIGHER OPERATIONAL READINESS**

By Lieutenant-Colonel Alain Cohen

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## **DIGITIZING GROUND FORCES FOR HIGHER OPERATIONAL READINESS**

We have to become better at performance measurement and anchoring ourselves in a results-based culture... The business of the Army is to prepare for and win the nation's fights, so it is all about readiness.

- General Lanthier, Commander Canadian Army<sup>1</sup>

“Can you deploy 300 soldiers tomorrow morning?” I remember being asked by the commanding general of a domestic task force, on a Saturday afternoon. It was the spring of 2017. A rising river was now flooding densely populated areas in the west-end of Montreal.

“Yes, we can” I had answered then, in my function as 34 Brigade's battalion-group commander.

We did so the next morning. Our battalion eventually grew to 600-strong, as neighbouring brigades reinforced us. However, in truth, the odds of fielding 300 soldiers on that first day had likely been equal or worse to the odds that we couldn't. I had no *real* view of my battalion's readiness, just like the task force commander had no *real* view of the readiness of his regular units not assigned to the “immediate response” role. Above him, the Commander of the Canadian Army, too, likely had had no *real* view of what readiness level, or what troop output, the division in the area could muster as he walked into brief the Minister of Defence and Prime Minister.

My positive answer to the task force commander had not been anchored in hard facts. The soldiers of my battalion were drawn from 13 different units. I had no clear view of their readiness beyond the static, incomplete and error-prone data held and manually entered by dozens of administrators in databases through legacy software. How many soldiers were up to date in first-aid training, or in their annual physical fitness test, required to deploy on a domestic operation? How many could I reasonably expect to raise their hands to volunteer for active duty? If it turned out that only 200 were available

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<sup>1</sup> Chris Thatcher, “Measuring readiness.” Canadian Army Today. October 2018  
<https://canadianarmytoday.com/measuring-readiness/>

within 24 hours, how soon could I hope to generate the missing hundred? And if, say, 400 were ready to report immediately, which of these should I activate based on their qualifications and other factors, such as the ripple effects on summer training?

My answer had had to rely on intuition alone. We had trained together throughout the year. The single theme I had pushed for was that of “operational readiness.” I trusted the battalion’s soldiers to heed the call. They did. Luck had filled the gap where synthesized, actionable data and insights had fallen short in an army whose general level of digitization was, and remains, far behind the leading edge.

Luck could also be found in the circumstances of the deployment. The floods were bad that year by historical standards; but no catastrophic loss of life was at stake, nor was this a matter of responding to an immediate threat to national security. The latter would have required a much more thorough interpretation of readiness associated with warfighting.

Such luck may run out one day.

The question this has raised in my mind ever since is, if one believes that an army’s primary responsibility in peacetime is to stand ready to defend the country’s security interests – are we doing our very best to manage and measure readiness? And moreover, if we aren’t but others are; how will our opponents draw advantages over us? And if we fail to be ready, how will our population look back at the Army whose job it was to ensure that it was?

The following essay submits that the Canadian Army has an obligation to become better at managing readiness and driving transparency down to the individual level. I argue that the Army should embrace digitization as a first step, and then layer on emerging methods in advanced analytics and machine learning to accomplish that goal. Furthermore, if readiness is the paramount objective of the *force generation*<sup>2</sup> function,

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<sup>2</sup> “Force generation is the process of organizing, training, and equipping forces for employment.” CFJP 01 Canadian Military Doctrine, Canadian Forces Joint Publication B-GJ-005-000/FP-001, issued April 2009, p.59

this essay concludes that progress made there will be foundational to applying augmented intelligence to the *force employment*<sup>3</sup> function to generate future tactical and operational advantages.<sup>4</sup>

### **A growing need for operational readiness**

“On the most basic level,” reads a DRDC paper on operations research, “military readiness consists of two elements: capability to execute a military task; and the time necessary to bring capability to the point that it is able to perform specified...tasks.”<sup>5</sup>

Readiness thus includes measures of “time” and “effectiveness.” In other words, calibration between the two depends on a commander’s assessment of when forces must be ready (“time”), and for what level of operational performance (“effectiveness.”) Both measures require the commander to assess a broad range of potential events requiring intervention (e.g., war with a given opponent, a natural disaster of a given scale in a given region).

It is also acknowledged that readiness can be interpreted at both the individual and collective levels. Every soldier in a battalion may be individually qualified to deploy; but as a whole, the battalion may not be ready for lack of advanced collective training, or due to a shortage of equipment required for the anticipated task. (This essay will blend

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<sup>3</sup> “Force employment is defined, at the strategic level, as the application of allocated military means to achieve specified objectives or effects through activities such as operations, defence diplomacy, and unilateral, bilateral, or multilateral defence activities.” *Ibid.*, p.57.

<sup>4</sup> Machine learning requires significant digitization of the Force to generate enough relevant data that can provide a basis for pattern recognition and prediction. Although this could suffice on its own to be the subject on a separate essay; the basic idea is that application of machine learning to land force employment is more complex than its application to force generation. Further note: A major and acknowledged limitation of this essay is that it does not attempt to take stock of the existing systems currently in use across the CAF with a force readiness nexus (e.g., MonitorMass for people readiness, the Land Equipment Management System [LEMS]). The author has little more than modest familiarity with these. An assumption is made with regards to their efficacy and level of sophistication by leading-edge digital standards. Nevertheless, none of the argumentation made here is about platforms or software per se; the argument for digitization and advanced analytics is much more about mindset, ambition and future approach for the Canadian Army to consider.

<sup>5</sup> Michel Roi, “Canadian Defence Priorities, CF Force Posture and Strategic Readiness Linking Government Policy Preferences to Resource Allocations,” Defence Research and Development Canada – Center for Operational Research and Analysis, DRDC CORA TM 2012-289, December 2012, p.iii.

both individual and collective readiness for conceptual simplicity; but some of the illustrative examples will focus on the more basic individual level.)

Undoubtedly in my view, we are re-entering a time – not experienced since the Cold War and likely surpassing it – where the effectiveness of our army will be measured by its level of readiness. At least three factors are contributing to this growing expectation:<sup>6</sup>

1. **The size of our Army has historically fallen, and is now stagnant, if not declining relative to the size of our population.** Moreover, anecdotal evidence suggests that the ratio of deployable personnel within the force has likely declined given the higher share of “institutional” billets (e.g., headquarters positions), as well as a greater tolerance for “restrictions” on deployability due to family and medical considerations. Even if the Army were to set ambitious growth targets; it remains to be seen whether it could “win the war” for talent in Canada’s current socio-economic context. It follows that the tasks expected of the Army will fall on the shoulders of fewer – signifying that the readiness of every soldier and sub-unit will matter more in the future than it has in the past.
2. **The volume of tasks is growing.** Geopolitical tensions are rising again, requiring ground forces to participate in deployed exercises, foreign military training missions, while continuing to engage in both stability operations and domestic security missions. Moreover, at home and abroad, the preponderance of natural disasters linked to climate change, or simply to morphing and expanding human population footprints, is on the rise.<sup>7</sup> While some of these events are at least seasonally predictable (e.g., forest fires, floods and hurricanes); others are not (e.g., earthquakes). In such events, the bar for readiness from a perspective of “time” is at an absolute high; just as it is for “effectiveness” where warfighting is

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<sup>6</sup> I submit these factors as hypotheses based on personal experience and understanding.

<sup>7</sup> Speech pronounced by Lieutenant-General Jeffrey S. Buchanan, Commander US Army North, May 14, 2019.

concerned. A greater number of natural disasters combined with an uptick in foreign deployments will exert greater pressure on readiness levels.

3. **The standards for force readiness are rising.** This is so given the increasingly complex qualification requirements driven by real or perceived needs,<sup>8</sup> and the prevalence of complex management technology and weapon systems employed at both the individual and collective levels. As such, a soldier or subunit we considered to be ready two decades ago based on a given amount of training and other criteria; may no longer meet today's threshold.

It follows from all the above that *more* is being expected from *fewer*. In other words, yesterday's tolerance for large armies with "at-best-implied" levels of readiness will soon disappear.

Some progress has been made in recent years towards managing total force readiness.<sup>9</sup> Pressure to do so has come from an unlikely source in the Government of Canada's wide-ranging "Departmental Results Framework."<sup>10</sup> The latter has called for all federal departments, including Defense, to explicitly identify and monitor indicators of effectiveness. For the military, this has de facto translated into measures of *readiness* – the chief output for an army not engaged in all-out war.

Why, one may ask though, should the Canadian Army have waited for a federal initiative equally applicable to Defence as it is to Fisheries, to pay more attention to measuring and managing readiness?)

Still, it appears today that the objectives of the Framework program have been only partially met. Much energy and resources have been invested; but the results

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<sup>8</sup> From the mundane requirements of "GBA+" training to new, advanced, tactical combat casualty care standards, and onto requirements to ensure that task forces are comprised of a minimum ratio of female personnel.

<sup>9</sup> For the sake of brevity, I have deliberately refrained from touching the subject of the Canadian Army's Managed Readiness Plan (MRP) and related Road to High Readiness (RTHR) program. For a fulsome discussion on the matter, see Major Douglas Russel, "Canadian Army Strategic Readiness – How Can We Improve?" *Canadian Forces College* Service Paper, 2017-18.

<sup>10</sup> Government of Canada. "The Departmental Results Framework and Program Inventory of the Treasury Board Secretariat" <https://www.canada.ca/en/treasury-board-secretariat/corporate/programs.html> consulted 20 May 2019.

outputted are at best inconsistent, at worst unreliable, static and generally devoid of much actionable insight.<sup>11</sup> The most limited introduction of basic metrics (e.g., what percentage of individuals are qualified in first aid training) has been met with either an inability to produce reliable data, or strong internal resistance to the added reporting burden. On the current path, as additional metrics are added; countless more soldier-hours will need be diverted to feed this program's requirements.

What is missing from the equation has been an accompanying digitization and advanced analytics strategy for the army to measure and manage its readiness levels. Insufficient progress has been made over the past decade within the Army. We have fallen far behind the corporate sector whose leading companies have undergone a digital transformation. And so, this fresh governmental demand for accountability against readiness has outstripped our army's ability to deliver.

### **Step 1 – Digitizing the Force from the ground-up**

Let's take the Canadian Army's Personal Weapons Test (PWT) as an example of one of many individual qualifications required to achieve a very basic level of *individual* operational readiness. Such a test must be performed successfully once a year; its level contingent on a soldier's trade, as well as the circumstances of deployment. From a soldier's perspective, the live fire exercise is an event that will be scheduled long in advance. Once the exercise is over, assuming the soldier has passed, the information is noted on a paper list that is eventually entered manually into a database where it will lay dormant until it is manually retrieved to produce a report. The system will neither generate any insight related to the trending quality of the marksmanship, nor will it offer a synthesized view of how that "data point" integrates into a broader assessment of that soldier or her unit's readiness. In the Army Reserve, where time and resource availability are hyper-compressed and discontinuous, there's a chance that the data may never even

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<sup>11</sup> Based on anecdotal evidence and author's personal experience.



get inputted. There's a higher chance, too, that those soldiers who were unavailable to participate in their unit's range weekend may not be offered an alternative opportunity that year.

Stepping up the level of digitization of the Canadian Army is not a panacea to *ensure* force readiness; but digitization can unquestionably enable better management and measurement of readiness. At a minimum, we could expect digitization to offer the following advantages with illustrative applications to the simple use case above:

1. **Better and faster insights for commanders.** Digitization enables faster data collection, and deeper analysis. It affords better visualization to allow the data and insights to be more accessible and informative to decision makers. Consider the use case of live fire training. What if a soldier's results were captured in real time across the country, automatically updating readiness levels as qualifications were achieved. Imagine, too, if a brigade commander could know within an instant which subunit were trailing in their qualifications; or if a company sergeant-major could be notified of which of his soldier's qualifications were about to expire, and which upcoming live fire ranges were being setup in the near future with spare capacity to load additional soldiers.
2. **Improved user experience for soldiers.** Digitization can be a major "experience booster" for soldiers. Both soldiers and commanders share the desire to minimize the amount of administrative work they must do, while maximizing the transparency of how they (and their units) are performing. Imagine if the soldier on the live fire range could have instantaneous access to his or her shooting record; and with that, benefit from additional insights, such as coaching tips appropriate to prior results and shooting patterns. Furthermore, could the results be professionally gamified to encourage maximum effort and self-improvement?<sup>12</sup>

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<sup>12</sup> In a fashion analogous to the introduction of achievement levels for the physical fitness test.

3. **Increased productivity.** Finally, digitization is widely recognized as a productivity improvement lever. Although this lever may not directly contribute to force readiness, it does so indirectly by freeing up warfighting resources to focus on their core functions (training and deploying). Let’s imagine that during or following the live fire range, no lists would have to be compiled and change hands; that no clerks and other NCOs would have to spend time manually and retroactively inputting results. This would be accomplished on-the-spot, using digital platforms. Moreover, digitization allows for robotic process automation, a field that is already seeing widespread adoption in the corporate sector, as well as the US Department of Defense.<sup>13</sup>

And still, beyond these advantages of digitization, other armies already have their eye on the next evolution, which represents the bigger prize.

## **Step 2 – Overlaying machine learning to force readiness**

Assessing collective force readiness beyond the individual level draws upon “...nearly every aspect of military decision-making, from tactical operations to force structure to budgeting,” as a consultancy report reads.<sup>14</sup> Supply chain, maintenance, and personnel-training data, to name a few parameters, need to be analyzed, as do their relationships to one another.

Of course, such assessments are already made today by staff and commanders. If one believes, however, that better assessments can be made through augmented intelligence, and that better *assessments* of readiness can lead to better *management* of

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<sup>13</sup> The US DOD has “innumerable” manual processes, which its new Joint Artificial Intelligence Center (JIAC) will look to automate (e.g., repetitive tasks, data searching, entry and fusion) to increase workforce productivity. US Government. “Army Directive 2018-18 (Army Artificial Intelligence Task Force in Support of the Department of Defense Joint Artificial Intelligence Center)” Secretary of the Army. Issued 2 October 2018.

[https://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/pdf/web/ARN13011\\_AD2018\\_18\\_Final.pdf](https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN13011_AD2018_18_Final.pdf)

<sup>14</sup> Frank Strickland, et al., “Military readiness through AI – How technology advances help speed up our defense readiness,” Deloitte Insights, April 24, 2019.

readiness – the question that follows is what is currently at the leading edge of adoption by military forces?

The US Marine Corps provides such an example. The Marine Corps has begun expanding the application of machine learning from diagnosing the health and readiness of military vehicles, to assessing the readiness of its Marines. Ultimately, the use case for machine learning applied to Marine Corps readiness is as follows according to their service provider IBM: “When a hotspot flares up or disaster strikes, planners can use this newly developed readiness tool to pick the right units to deploy for each situation while balancing the need to allocate forces for future missions and while minimizing impacts to future readiness.”<sup>15</sup> The pilot underway “...applies parameters including depth-to-dwell ratio (the amount of time a Marine spends at home versus time he/she spends deployed); the types of units (infantry, aviation, etc.) and their respective readiness.”<sup>16</sup>

Contrasted to human analysis alone that is generally based on static data compiled from various sources (for example, in Excel worksheets), this new approach looks to provide the commander and staff with augmented intelligence. Various unit deployment scenarios can be:

...toggled to show the ripple effects through *five years* of planning. It’s all done with a click and a drag. The custom dashboard allows commanders to see the readiness level – skills, length of current deployment, distance from battle zone – of the units on a single pane of glass, to aid their decision-making, getting the right people to the right place at the right time....The goal is to implement an all-force planning tool that gives decision-makers the data to understand where to invest in additional training and recruitment, stay prepared for emergencies and unexpected conflicts....<sup>17</sup>

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<sup>15</sup> IBM, “Getting them to battle—and back: how AI is transforming readiness and the way Marines are deployed,” <https://www.ibm.com/industries/federal/national-security/marine-corps-ai-readiness>

<sup>16</sup> *Ibid.*

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

And still beyond this level of *descriptive*<sup>18</sup> analytics, the Marine Corps wishes to develop *predictive* analysis for force readiness applications; whereby machine learning can generate recommended courses of action to further accelerate and enhance human decision making. As such, suggestions could be made to commanders and staff on how to prepare – in what sequence and level – various units for potential deployment, even predicting the need for future surges in individual qualification courses and recruitment requirements for new Marines.

### **Conclusion – Readiness is a first step**

An analogous concept to readiness in the commercial world can be found in “productivity.” The latter can be described as measuring and improving the amount of output an enterprise can generate for a given amount of input. Firms who fall behind their peers in productivity become uncompetitive and are either restructured, transformed or forced to close. Governments have every obligation to ensure that their defence forces are as productive, or in other words as *ready*, as can be. Commanders at all levels have a duty to ensure it.

Like any institutional form of change, however, one can expect challenges. Digitizing readiness measurement and management, to then overlay machine learning, will face a host of obstacles ranging from data ownership and security, to system compatibility and AI talent sufficiency. With this in mind, the Canadian Army should start small, setting its sights on solving for a few, “high-payoff” use cases. Doing so can build momentum through quick wins that address real challenges. Efforts in digitization

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<sup>18</sup> Descriptive Analytics use data aggregation and data mining to provide insight into “What has happened?” Predictive Analytics use statistical models and forecasts techniques to answer: “What could happen?”

should also be paralleled with an institutional push to instill a readiness *mindset*. The Canadian Army is capable of doing so. It succeeded a few years ago when it sought to instill a mindset of “adaptive learning” at the height of Op ATHENA, through “lessons learned,” and “after-action reviews” that were integrated into battle procedure at the ground level.

Finally, it is well to conclude with a reminder that if readiness is the paramount objective of *force generation*; the latter ultimately serves to enable *force employment*. The final prize for machine learning application sits with the latter. For land forces, that application is still some distance away. However, an investment today in developing an augmented intelligence muscle applied to the more attainable, and sooner needed goal of *readiness* will not be lost.<sup>19</sup>

Looking to the future, there is no question as to whom will have the military upper hand between the *haves* and *have-nots* of artificial intelligence.<sup>20</sup>

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<sup>19</sup> This comment applies to conventional land forces and *use of forces*. Of course, artificial intelligence applications that are already being fielded by foreign militaries in the targeting domain, for example, will have a direct impact on land warfare. So will robotic drone warfare, which will likely blur the lines between the air and land domains.

<sup>20</sup> For a through discussion on the matter, see “China’s military is rushing to use artificial intelligence.” *MIT Technology Review*. February 7, 2019 <https://www.technologyreview.com/f/612915/chinas-military-is-rushing-to-use-artificial-intelligence/>

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