





## LEVERAGING DATA SCIENCES AND ANALYTICS FOR THE RCAF

#### Major Christian N. Labbé

## **JCSP 47**

## **Service Paper**

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#### LEVERAGING DATA SCIENCES AND ANALYTICS FOR THE RCAF By Major Christian N. Labbé

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## LEVERAGING DATA SCIENCES AND ANALYTICS FOR THE RCAF

#### AIM

1. This goal of this service paper is to discuss the opportunities presented to tactical and operational level units within the RCAF as a result of the establishment of the Assistant Deputy Minister for Data, Innovation, and Analytics - ADM(DIA). It will provide a recommended approach for the RCAF to leverage the benefits of data science integration at the tactical and operational levels.

## INTRODUCTION

2. A new ADM position was created in July 2018 dedicated to departmental implementation of Data, Innovation and Analytics strategies.<sup>1</sup> Its mandate includes the provision of strategic leadership, governance and guidance to successfully transition National Defence to a data-driven organization that manages data as an enterprise asset and uses it effectively for evidence-based decision-making. It is also meant to drive analytics adoption and maturity throughout DND/CAF and lead the department-wide initiative to establish data governance.<sup>2</sup> It published the *DND/CAF Data Strategy* in 2019, laying out a roadmap for and identifying activities to enable the use of analytics within the Department.<sup>3</sup>

3. ADM(DIA) has started engaging with various L1 organizations, including the RCAF, to develop policies and identify important data sets of operational and strategic significance. While this initial engagement has led to a few RCAF data driven initiatives being submitted to ADM(DIA) for development, the capacity of their core analysis team to act on these problems is limited to their small size and modest budget. Ultimately, the long-term ADM(DIA) operating model will not rely on solving problems directly for other L1 organizations, but instead to act as a Center of Excellence in providing advice and expertise to individual teams within other L1s.

#### DISCUSSION

4. This new focus on data-driven decision making and data governance shows great promise for an organization like the RCAF. Management of finite RCAF resources such as yearly flying rates, aircraft, personnel, and operation & maintenance funds is a complex endeavor, which has proven to be a limiting factor in our ability to generate ready force elements to meet our Departmental Result Framework targets.<sup>4</sup> Applying data governance and analytics best practices to optimize our management of these resources would ensure that we maximize the output of our organization.

<sup>&</sup>lt;sup>1</sup> Walsh, John. "Director General Data Analytics, Strategy and Innovation", Presentation, Canadian Forces College, Toronto, ON, 18 November 2020.

<sup>&</sup>lt;sup>2</sup> DND. "Assistant Deputy Minister (Data, Innovation, Analytics)", accessed 21 January 2021, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/transition-materials/defence-101/2020/03/defence-101/adm-dia.html.

<sup>&</sup>lt;sup>3</sup> DND. "DND/CAF Data Strategy", accessed 21 January 2021, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/data-strategy.html.

<sup>&</sup>lt;sup>4</sup> Treasury Board Secretariat. "DND Departmental Results Framework", GC InfoBase, accessed 25 January 2021, https://www.tbs-sct.gc.ca/ems-sgd/edb-bdd/index-eng.html#orgs/dept/133/infograph/results.

5. While DND has only recently started turning itself towards the digitization of its enterprise, the private sector has already been investing heavily to integrate data sciences as part of their business decision making processes. Recognizing the improvements in access to data processing technologies, the International Air Transportation Association (IATA) released a 2019 White Paper on the use of analytics in the aviation sector.<sup>5</sup> Examining current technology trends and the case of three airlines (Air-France KLM, United and Delta) that have already integrated analytics into their businesses, the IATA found that areas showing a high potential for significant value and benefits include aircraft maintenance, operations management, disruption management and enterprise-level forecasting. Notably, it highlights the successes of Air France-KLM in forecasting delays and analyzing root causes to prevent service disruptions. The White Paper also reveals the organizational challenges associated with the widespread adoption of data sciences. These include critical access to accurate and relevant data, the need for an open culture towards data, and the creation of internal development capabilities to embed analytics into everyday processes. Overall, it appears that the aviation industry is well positioned to benefit from the widespread adoption of data sciences.

6. Although the RCAF is not a business venture centered on delivering maximal profit to its shareholders like the aforementioned airlines, it shares with them the will to accomplish its mission reliably and safely, while minimizing the waste of human resources, material, and capital. In this regard, the RCAF has experienced certain challenges in meeting some of its Departmental Result Framework targets. For example, the percentage of aerospace fleets that are serviceable to meet training and readiness requirements falls nearly 25% short of its 85% target. The rate at which search and rescue operations meet their established responses standards is 15% below target.<sup>6</sup> These are both areas (aircraft maintenance and operations management) which were identified as having high value potential for aviation. If the RCAF eventually transitions to a common maintenance electronic records keeping system, such as the Defence Resources Management and Information System (DRMIS), it could likely leverage advanced data analytics to maximize the availability of assets. Methods through which this might be achieved include failure prediction, supply stocks optimization, and on-site interpretation of aircraft health monitoring data.<sup>7</sup> In the realm of search and rescue response times, analysis of operational mission information collected could be interpreted not only to determine the root cause of failures, but to predict factors which can impact the search and rescue posture automatically, allowing commanders to take action and anticipate disruptions.

7. From a different perspective, the RCAF could use data analytics to leverage existing systems and platforms to its benefit. Everyday, sensors on RCAF assets generates great volumes of data that might not be fully analysed unless an exceptional event occurs (such as in the case of an inflight anomaly), or if a human is looking for something specific (such as an intelligence analyst observing a target). Great troves of data, which might contain valuable information, are therefore left unanalysed. By structuring data according to common standards, and developing the right algorithms to combine the analysis of various sources, it is possible to create operational

<sup>&</sup>lt;sup>5</sup> International Air Transport Association. "Data Science Hype or Ripe for Aviation?", Aviation Data White Paper Series, IATA, Montreal, QC, June 2019.

<sup>&</sup>lt;sup>6</sup> DND. "DND/CAF Data Strategy", accessed 21 January 2021, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/data-strategy.html.

<sup>&</sup>lt;sup>7</sup> Ibid., 12, 14-16, 19.

value. For example, Delta Air Lines is now leveraging a systems that combines data from existing sensors with crowdsourced pilot observations to create more accurate live turbulence models, allowing their flight crews to make decisions in regards to routing and on when to secure the cabin.<sup>8</sup> This is only a simple example, but the RCAF could find vastly different opportunities. Since military aircraft, and particularly Intelligence, Surveillance and Reconnaissance platforms, have the potential to be outfitted with more sensors than regular civilian airliners, they are likely to make additional data available for analysis during their operation than their non-military counterparts. Understanding where these opportunities lie will require a degree of data standardization, but more importantly, grassroots efforts by individuals working in an organization that has adopted a strong data culture. Data-minded individuals who have an understanding of the volumes of information which is available to them, and how they might be processed and analysed, will be more likely to employ data solutions to solve operational problems. The RCAF might even be able to leverage its Waterloo Flight Deck to build prototype software and quickly validate the instincts of those aviators familiarized with data sciences.<sup>9</sup>

8. The high value areas identified by the IATA are equally as applicable to a public organisation like the RCAF as it is for a private venture. Nonetheless, an important distinction exists due to the primacy of operations in a military service, where the efficiency and optimization will always rank behind effective accomplishment of the objective.<sup>10</sup> For this reason, it is critical that any initiative to further apply data sciences to decision making in the RCAF be extremely closely linked to a deep understanding of our mission. A misguided application of business optimization concepts at the expense of a tactical commander's ability to execute their assigned tasks will quickly negate the benefits of such a strategy. It is therefore critical that data solutions be developed, reviewed and fully understood by all those involved in the delivery of air power, from the tactical to the strategic level. Shortfalls that might not be apparent to headquarters staff developing a data initiative might be pointed out by an aviator in a field unit as long as both understand the underlying data strategy and communicate using a common understanding of analytics principles.

9. This challenge is identified in the IATA white paper as one of the obstacles to the application of comprehensive data analytics practices. An open culture, internal capacity, and ultimately, a widespread understanding of data sciences is required for a successful implementation. Due to a lack of a comprehensive development strategy, the data literacy rate at multiple levels of the RCAF Chain of Command remains relatively low. Combined with the absence of a common data collection framework, this poses a great challenge to the successful use of data analytics to improve service delivery. While various L1s have submitted a number of proposals to ADM(DIA) for pilot projects, the core application of data-driven approaches is expected to occur within each individual organization, managing their own data. To achieve this, our units and formations require embedded data practitioners who are able to identify unit needs, and develop predictive models to enable Command decision making. Additionally, the majority

<sup>&</sup>lt;sup>8</sup> International Air Transport Association. "Data Science Hype or Ripe for Aviation?", Aviation Data White Paper Series, IATA, Montreal, QC, June 2019, 22.

<sup>&</sup>lt;sup>9</sup> The Flight Deck. "About", accessed 26 January 2021, https://www.theflightdeck.ca/about.

<sup>&</sup>lt;sup>10</sup> Canada. Department of National Defence. A-PA-005-000/AP-006, Leadership in the Canadian Forces: Leading the Institution. Kingston, ON: Canadian Defence Academy — Canadian Forces Leadership Institute, 2007, 5.

of RCAF operational data is currently managed through ad hoc, locally-developed systems, which do not follow data governance best practices. Units have so far simply lacked comprehensive direction and proper training to effect anything beyond these solutions, which are unable to interact with each other or be subject to predictive analysis.

10. To meet this challenge and fully take advantage of the roll-out of the DND/CAF Data *Strategy*, the RCAF will need to leverage data literacy development efforts spearheaded by ADM(DIA) and create its own data management framework. ADM(DIA) has recently completed its data & analytics training needs assessment and will soon be ready to lead training efforts for other L1s.<sup>11</sup> The RCAF should leverage this upcoming training opportunity to develop its own expertise by sending at least one individual per unit and formation for initial cadre training. After this, data analytics training should become part of force posture and readiness requirements for units to maintain at least one continuous Data Officer position. As the responsibilities of a Data Officer are expected to require the development of a certain level of expertise, it would be preferable to employ individuals who will be able to maintain these positions over multiple years. Therefore, the use of Reserve Positions, DND employees, or contractors would be preferred to minimize the potential loss of corporate knowledge created by the repeated posting cycles to which Regular Forces members are subjected. The value of such an individual in collecting, processing and analysing data would be tremendous if a unit was, for example, attempting to rectify the aforementioned issue with regards to search and rescue response times. With the right training, the Data Officer will be able to recognize how to integrate existing systems to collect accurate and relevant data, ultimately being able to work with unit leadership to present recommendations to their Commanding Officer.

11. The DND/CAF Data Strategy calls for L1 organisations to perform continuous stakeholder analysis and reinforce a data culture.<sup>12</sup> To ensure that the RCAF can accomplish these activities and oversee Data Officers, the establishment of an RCAF center of expertise is required. As the focal point for concept development and experimentation, exploitation of synthetic environments, and as a capability enabler to support operations, the RCAF Aerospace Warfare Center (RAWC) is believed to be best positioned to house this responsibility.<sup>13</sup> Therefore, in addition to the new positions at each RCAF unit and formation, the RCAF Aerospace Warfare Center should establish the RCAF's Analytics Support Center and stand up a Data Management Coordination Committee to provide standardization and oversight to Unit Data Officers. They will also act as the liaison to the ADM(DIA) Data and Program Oversight Committee. In this, the Analytics Support Center would be able to leverage the national capabilities offered by ADM(DIA) when presented with a proposed project that exceed the capabilities of Unit Data Officers. Through ADM(DIA), it would also be able to influence DND/CAF-wide decisions with regards to the development of data systems and standards to ensure compatibility with RCAF systems and sensors.

<sup>&</sup>lt;sup>11</sup> Walsh, John. "Director General Data Analytics, Strategy and Innovation", Presentation, Canadian Forces College, Toronto, ON, 18 November 2020, 10.

<sup>&</sup>lt;sup>12</sup> DND. "DND/CAF Data Strategy", accessed 21 January 2021, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/data-strategy.html.

<sup>&</sup>lt;sup>13</sup> Royal Canadian Air Force. "RCAF Aerospace Warfare Center", accessed 25 January 2021, http://www.rcaf-arc.forces.gc.ca/en/cf-aerospace-warfare-centre/index.page.

12. The presence of trained personnel in each unit and a national center of expertise will provide a framework for implementation of data analytics within the RCAF, but overall data literacy and culture will still need to be instilled to all members for the strategy to be effective. While Data Officers and the RAWC will have a role to play in promotion and education, the bulk of personnel could better be reached through formal education and communication. A training needs analysis should be conducted in collaboration with the RCAF Academy and Barker College to include data sciences familiarization at various levels of common RCAF professional development. Inclusion into the curricula of the Basic Air Environmental Qualification (BAEQ) for non-commissioned members and Air Force Officer Development (AFOD) program should be considered to cover the vast majority of RCAF members. Certain individuals will necessarily be out of scope for new common core training and education. Reaching these members, who might have already graduated from these courses or be DND employees, could be achieved through a separate strategic communication campaign.

## CONCLUSION

13. The creation of a new L1 organization centered on data, innovation and analytics presents an important opportunity for the RCAF to optimize its operational output by improving the management of its finite resources and providing data-driven decision making tools to its Commanders. The RCAF's efforts in this regards must align with the *DND/CAF Data Strategy*, which rests on the development of local expertise and data management practices within each L1 organizations. The implementation of advanced data analytics methods has proven its potential in the airline industry and has garnered the support of aviation oversight organizations. While it is difficult to pinpoint the exact quantitative benefits that the RCAF could experience, comparable private sector organizations appear to be deriving value from embracing data sciences in maintenance, operations and disruption management. In leveraging the emerging analytics field, the RCAF should strive to implement a data management strategy that rests on developing its internal expertise while reinforcing a data culture to improve the ability of our tactical and operational level commanders to deliver on their mandates.

#### RECOMMENDATION

14. The RCAF should publish its own implementation directive to: reinforce the importance of the *DND/CAF Data Strategy*, tailor it to its needs, encourage grassroots efforts, and spur the other initiatives required to move towards becoming a data centric organization. It should also establish new Data Officer positions in each RCAF unit and formation, with ADM(DIA)-led training as a positional requirement. It should create the RCAF Analytics Support Center and a Data Management Coordination Committee within the RAWC by 31 March 2022 to assist in shepherding the transition. It should also conduct a review of RCAF common training and education, as well as develop a communication plan to promote data culture by improving awareness to the potential tactical and operational benefits of the application of data sciences.