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Cleared to Takeoff? Preparing the RCAF For the Integration of RPAS Capability

Major Saif Aboud

Canada

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PREPARING THE RCAF FOR THE INTEGRATION OF RPAS CAPABILITY

AIM

1.   The aim of this paper is to highlight to Royal Canadian Air Force headquarter (RCAF HQ) staff the critical role of Canadian Armed Forces (CAF) Level One (L1) organizations in addressing the challenges associated with the integration of remotely piloted aircraft systems (RPAS) into the RCAF. RPAS capabilities must be integrated successfully into the broader CAF strategic framework through coordinated efforts across L1 stakeholders, including personnel, infrastructure, IT systems, and policy.

INTRODUCTION

2.   In December 2023, the Government of Canada announced a $2.49 billion investment to modernize the RCAF by acquiring RPAS capability through its *Strong, Secure, Engaged* (SSE) defence policy.[1] Highlighted as essential in both the SSE policy and the Pan-Domain Command and Control (PDC2) concept, RPAS are critical for enhancing intelligence, surveillance, and reconnaissance (ISR) capabilities, particularly in addressing Arctic security and global threats.[2] These advanced systems enable persistent surveillance, real-time intelligence sharing, and operational reach, supporting national defence priorities and allied missions such as NORAD and NATO operations. Moreover, RPAS integration aligns with the CAF's transformation goals to achieve multi-domain interoperability and data-driven decision-making in a rapidly evolving security landscape.[3] This paper will explore the key factors affecting the integration of the RPAS platform, focusing on its evolution from a standalone aircraft to a fully integrated system. It will provide broad insights into why contracting services, training, and maintenance cannot be managed independently and emphasize the critical role of the RCAF's expertise and collaboration with other L1 organizations in ensuring successful integration.

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[1]   National Defence, "Canada Acquiring Remotely Piloted Aircraft Systems for the Canadian Armed Forces," news releases, December 19, 2023, https://www.canada.ca/en/department-national-defence/news/2023/12/canada-acquiring-remotely-piloted-aircraft-systems-for-the-canadian-armed-forces.html.
[2]   Department of National Defence, "Strong, Secure, Engaged: Canada's Defence Policy," navigation page - audience page, June 10, 2024, 65, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canada-defence-policy.html.
[3]   National Defence, "Pan-Domain Command & Control (PDC2) Concept Paper," December 9, 2024, 3–4, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/pan-domain-command-control.html.

3.   **Limitations of service paper.** This paper acknowledges that the RPAS platform procurement program is directed by the Assistant Deputy Minister (Material) (ADM(Mat)) group and sponsored by the RCAF, with an oversight from the RPAS Project Management Office (PMO). Additionally, other Department of National Defence organizations, such as General Data Services (GDS) and ADM (Infrastructure & Environment) (ADM(IE)), play key roles in implementing the necessary infrastructure and IT systems to support this capability. The points being discussed are not unfamiliar to the involved offices and departments; rather, the purpose is to emphasize considerations relevant to RCAF HQ and other L1 organizations. The focus is specifically on the operational level, where strategic planning decisions will be essential in shaping the future of the RCAF's RPAS platform capability.

DISCUSSION

4.   **The RPAS platform selected for the CAF as a capability**. The MQ-9B SkyGuardian, a cutting-edge RPAS, represents a critical capability for the RCAF as it aligns with the pan-domain employment concept, the RCAF Strategy, and Canada's defense policy, SSE. Equipped with advanced ISR systems, the MQ-9B SkyGuardian significantly enhances the RCAF's ability to fulfill the "Anticipate, Adapt, and Act"[4] framework outlined in SSE by providing real-time intelligence, persistent surveillance, and precision targeting across diverse operational environments; The MQ-9B SkyGuardian empowers the RCAF to anticipate emerging threats, adapt to rapidly changing conditions, and act decisively in complex operational scenarios. The MQ-9B, with its unmatched flight endurance of over 40 hours, multi-sensor payload capacity, and ability to operate in contested and remote environments, offers capabilities not commonly found in other RPAS market offerings. Its seamless integration across air, land, maritime, and cyber domains supports the pan-domain employment concept by bridging operational silos and ensuring interoperability with allied forces, providing unparalleled flexibility and scalability.[5] The platform's advanced detect-and-avoid technology and ability to operate in both civilian and military airspace further enhance its utility in domestic and international missions.[6] This capability directly aligns with the RCAF Strategy's focus on modernization and operational effectiveness, ensuring the force remains agile and capable of addressing evolving security challenges while maintaining Canada's commitment to a strong and secure defense posture.

5.   **The CAF functional components of capability**. In the Canadian Defence context, a capability is built from several interrelated components that collectively enable the military to achieve the desired objectives. These components include personnel, who provide the human

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[4]   Department of National Defence, "Strong, Secure, Engaged."

[5]   "MQ-9B SkyGuardian," General Atomics Aeronautical Systems Inc., accessed December 30, 2024, https://www.ga-asi.com/remotely-piloted-aircraft/mq-9b-skyguardian.

[6]   "GA-ASI Successfully Tests Air-To-Space Laser Communication System," General Atomics Aeronautical Systems Inc., accessed December 30, 2024, https://www.ga-asi.com/ga-asi-successfully-tests-air-to-space-laser-communication-system.

resources needed to operate and sustain the capability; research and development, which drive innovation and continuous improvement; infrastructure and organization, encompassing the physical facilities and structures that support operations; and concepts, doctrine, and training, which establish the operational guidelines and prepare individuals and units for deployment. Additionally, information technology (IT) infrastructure ensures robust communication and data management, while equipment, supplies, and services provide the tools, materials, and logistics essential for effective functioning. These elements must work together seamlessly to create a capability that is operationally effective and sustainable over time.[7]

a. **Personnel and training**. The CAF faces significant personnel challenges that could undermine the successful integration and operationalization of the RPAS capability, which is vital for its efforts. While CAE – a company formerly known as Canadian Aviation Electronics – has been contracted to provide aircrew and maintenance technician training, as well as in-service support, the CAF still requires a highly skilled and sustainable workforce to manage, operate, and maintain the RPAS program.[8] This includes personnel capable of handling the technical complexities of RPAS operations and ensuring interoperability with Arctic surveillance, NORAD, and NATO missions. Despite ongoing recruitment, the CAF continues to experience a shortfall in deployable personnel, with many recruits awaiting specialized training due to bottlenecks in the training system caused by a lack of qualified instructors.[9] The increasing demand for expertise in unmanned aerial systems, combined with existing personnel shortages, creates a critical need for streamlined recruitment and training processes. Re-engaging recently retired personnel as instructors and offering incentives for veterans to temporarily re-enlist could provide an immediate solution to address the shortfall in training capacity. This is not limited to pilots and maintainers, but could include intelligence analysts, cyber operators, IT personnel, logisticians, etc. Additionally, the CAF must accelerate efforts to fill gaps in its workforce to ensure that it has the personnel required to support RPAS operations effectively. Without these measures, the CAF risks jeopardizing its ability to meet operational demands and fully realize the benefits of its investment in RPAS capabilities.

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[7] Aaron C Taliaferro et al., "Defense Governance and Management: Improving Defense Management Capabilities of Foreign Defense Institutions A Guide to Capability-Based Planning (CBP)," *Institute for Defense Analyses*, 2019, 7-8–9, https://www.proquest.com/reports/defense-governance-management-improving/docview/2496192850/se-2.

[8] "CAE Awarded Contract to Support MQ-9B SkyGuardian® Remotely Piloted Aircraft Systems for Canada's Defence Forces," *PR Newswire*, May 30, 2024, https://www.proquest.com/docview/3061806658/citation/BFDDE12E1BCB40AEPQ/1.

[9] "ON TARGET: Canadian Armed Forces: The Numbers Don't Add Up," espritdecorps, October 16, 2024, https://www.espritdecorps.ca/on-target-4/on-target-canadian-armed-forces-the-numbers-dont-add-up.

b. **Infrastructure and Organization**. The integration of RPAS into the RCAF presents substantial infrastructure challenges. The acquisition of advanced platforms like the MQ-9B SkyGuardian requires dedicated facilities, such as specialized hangars, ground control centers, and advanced information technology systems to manage data flow, cybersecurity, and real-time intelligence dissemination.[10] While investments have been planned, delays in infrastructure development could hinder the RPAS program's operationalization, particularly in remote locations like northern Canada, where forward operating bases must be equipped to handle RPAS operations in extreme environments. Additionally, the coordination between ADM(Mat) and ADM (IE) to implement the required, or upgrade current infrastructure, highlights the complexity of modernizing existing bases to support cutting-edge technology.[11] Organizationally, the integration of RPAS demands significant restructuring within the RCAF and the broader CAF. The current organizational model, designed around traditional manned platforms, struggles to adapt to the unique operational, maintenance, and command requirements of unmanned systems. Effective RPAS integration requires robust cross-domain collaboration, especially within joint intelligence, surveillance, and reconnaissance (JISR) operations, which demand seamless data sharing across multiple CAF branches. Moreover, gaps in governance frameworks and oversight mechanisms have been flagged as barriers to ensuring accountability and effective management of this capability.[12] Without a coherent strategy for aligning organizational structures and defining roles, the operational potential of RPAS may remain underutilized.

c. **Concept, policy, and doctrine**. Integrating RPAS into the RCAF presents various policy and doctrinal challenges that need to be resolved to achieve operational success. Current RCAF doctrine emphasizes centralized command and decentralized execution, a framework that may need to be reexamined to accommodate the unique operational and logistical demands of RPAS.[13]

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[10]   "CAE Awarded Contract to Support MQ-9B SkyGuardian® Remotely Piloted Aircraft Systems for Canada's Defence Forces."

[11]   National Defence, "Future Force Design," navigation page, December 19, 2023, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/departmental-results-report/2022-23-index/results-core-resp/future-force-design.html.

[12]   Major Matt Fraser, "Precision-Strike RPAS: A Watershed in Canadian Defence Capabilities" (Canadian), 4–6, accessed January 14, 2024, https://www.cfc.forces.gc.ca/259/290/308/305/330.pdf.

[13]   Department of National Defence, "Royal Canadian Air Force Doctrine: Air and Space Power," *B-GA-400-000/FP-001, 4th Edition*, August 2023, https://mars.cfc.forces.gc.ca/CFCLearn/pluginfile.php/48745/mod_folder/content/0/English/B-GA-400-000-FP-001-%20RCAF%20Doctrine%20-%20Air%20%20Space%20Power.pdf?forcedownload=1.

Unlike traditional crewed platforms, RPAS requires a distinct approach to multi-domain integration, decision-making, and mission planning. The existing policy environment also poses challenges, as RPAS capabilities must align with overarching Canadian defence policy objectives, such as those outlined in SSE while remaining interoperable with NATO and NORAD allies.[14] Furthermore, gaps exist in the doctrinal alignment of RPAS operations within the broader context of joint and pan-domain command and control, requiring the development of new concepts to fully integrate RPAS into Canada's force employment model. Addressing these policy and doctrinal issues will require a coordinated effort to redefine operational roles, revise training paradigms, and ensure the legal and ethical use of RPAS technology within the RCAF's operational framework.[15]

d.   **IT infrastructure and ISR**. The integration of RPAS into the RCAF encounters significant IT challenges, including satellite communications (SATCOM), which can impact ISR functionality. SATCOM infrastructure is essential for RPAS operations, as it provides the link for transmitting real-time flight instructions and surveillance data over vast and remote areas such as the Arctic.[16] Limited satellite coverage at high latitudes poses significant risks to the reliability and continuity of RPAS missions. The harsh Arctic conditions, including extreme temperatures and remote runways, further exacerbate these challenges, requiring the modification of RPAS platforms to operate effectively under such conditions.[17] In addition, the RCAF's ISR framework requires substantial adaptation to accommodate the complexities of RPAS capabilities. Current ISR doctrine does not account for the unique operational demands of RPAS, including near-continuous data collection and multi-sensor integration that requires robust communication networks and enhanced data processing capacities.[18] This challenge is compounded by the need to integrate RPAS into the RCAF's broader ISR enterprise, ensuring seamless interoperability with existing systems and allied operations under NORAD and NATO frameworks. Furthermore, ISR operations rely on skilled personnel and advanced analytics to process and disseminate the vast amounts of data collected by RPAS, highlighting gaps in both technical infrastructure and human resources. Addressing these challenges will require significant

[14]   Department of National Defence, "Strong, Secure, Engaged."
[15]   Fraser, "Precision-Strike RPAS: A Watershed in Canadian Defence Capabilities," 8–10.
[16]   "GA-ASI Successfully Tests Air-To-Space Laser Communication System."
[17]   "Canadian Military Drones Will Face Challenges in Arctic | Ottawa Citizen," accessed January 19, 2025, https://ottawacitizen.com/news/national/defence-watch/canadian-military-drones-challenges-arctic-rcaf-report.
[18]   Department of National Defence, "Royal Canadian Air Force Doctrine: Intelligence, Surveillance and Reconnaissance," *B-GA-401-002/FP-001, 4th Edition*, n.d.

investment in SATCOM capabilities, Arctic-specific infrastructure, IT infrastructure, and the development of an integrated ISR strategy tailored to leverage the full potential of RPAS platforms.

e. **Equipment, supplies and services**. This section focuses on the logistical and maintenance support for the capability. The RCAF faces significant challenges related to equipment, supplies, and services required for integrating RPAS, particularly in the areas of ordnance storage and maintenance record integration. The procurement of MQ-9B SkyGuardian systems includes advanced munitions such as Hellfire missiles and laser-guided bombs, necessitating specialized storage facilities that comply with strict safety and security standards by director ammunitions and explosives regulations (DAER).[19] Moreover, according to Chapter 8 of End-Use Monitoring of U.S.-Origin Defense Articles, US ammunition must handled according to *Golden Sentry Standard*, which require "…complying with the requirements imposed by the [U.S. government] USG with respect to the use, transfer, and security of defense articles and defense services."[20] Meeting this standard is particularly demanding and poses a significant hurdle, especially for remote and northern locations designated for Arctic surveillance. While CAE has been awarded the contract for RPAS maintenance, it is critical that ADM(Mat), as the strategic function holder for equipment, material, and ammunition program, ensures the seamless integration of the RPAS maintenance system with the CAF's enterprise resource planning systems, including the Defence Resource Management Information System (DRMIS) and the Ammunitions Information and Maintenance System (AIMS).[21,22] This integration is essential to effectively track and manage maintenance, repairs, and the inventory of parts and munitions across the sophisticated RPAS components, such as radars and electronic surveillance systems. Failure to meet these requirements could result in inefficiencies, delays in operational readiness, and compromised life cycle management of the capability.

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[19] National Defence, "DAOD 3002-3, Ammunition and Explosives Safety Program," policies, November 13, 2013, https://www.canada.ca/en/department-national-defence/corporate/policies-standards/defence-administrative-orders-directives/3000-series/3002/3002-3-ammunition-and-explosives-safety-program.html.
[20] "Chapter 8 | Defense Security Cooperation Agency," accessed January 24, 2025, https://samm.dsca.mil/chapter/chapter-8#C8.2.
[21] National Defence, "Assessment of the Defence Resource Business Modernization Programme," March 8, 2022, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/assessment-defence-resource-business.html.
[22] National Defence, "Audit of Ammunition and Explosives Management," audit, March 8, 2019, https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/audit-ammunition-explosives-management.html.

6.   **Additional capabilities consideration**. While intelligence and interoperability are not explicitly designated as standalone components in the CAF functional capability framework, other Five-Eyes nations recognize them as overarching elements.[23] Given the advanced technological demands and operational adjustments associated with integrating the F-35 platform, the RCAF and ADM(Mat) should address these areas with dedicated focus:

  a. **Intelligence and targeting.** The integration of RPAS into the RCAF faces significant intelligence and targeting challenges, particularly within the framework of an evolving multi-domain operation. Although the establishment of the Joint Intelligence Operations Centre (JIOC) enhances Canada's capacity for centralized intelligence fusion and dissemination, the sheer volume of data generated by RPAS platforms demands advanced processing, exploitation, and dissemination (PED) capabilities that exceed current resources.[24] Targeting challenges are further complicated by the need for real-time intelligence synchronization, particularly in Arctic and remote regions where limited infrastructure and connectivity hinder operational effectiveness.[25] Additionally, the RCAF's adherence to government policies on ethical targeting and data use requires robust governance mechanisms to prevent misuse of RPAS capabilities. Addressing these challenges will necessitate investments in ISR-specific training, automated data analytics, and resilient communication networks to enable timely and precise targeting within the RCAF's evolving operational environment.

RECOMMENDATIONS

7.   Given the challenges noted above, RCAF HQ staff will need to consider the following factors when developing their plans for RPAS platform integration at the operational level:

  a. Chief of Military Personnel (CMP) must prioritize tailored recruitment and retention programs focused on RPAS-specific skills. CAF should oversee reforms to the training pipeline, leveraging retired personnel as temporary instructors and incentivizing veterans to rejoin. Infrastructure and contracting.

  b. ADM(IE) and ADM(Mat) must expedite the design and construction of RPAS-specific facilities, including Arctic-ready hangars and forward

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[23]   Taliaferro et al., "Defense Governance and Management: Improving Defense Management Capabilities of Foreign Defense Institutions A Guide to Capability-Based Planning (CBP)," 9–11.

[24]   National Defence, "Joint Intelligence Operations Centre Stands Up," December 6, 2021, https://www.canada.ca/en/department-national-defence/maple-leaf/defence/2021/12/joint-intelligence-operations-centre-stands-up.html.

[25]   "Canadian Military Drones Will Face Challenges in Arctic | Ottawa Citizen."

operating bases. ADM(IE) and ADM(Mat) must synchronize efforts to ensure infrastructure readiness aligns with RPAS deployment schedules.

c.   GDS must prioritize upgrades to IT infrastructure and SATCOM capabilities, ensuring the required bandwidth and reliability for RPAS missions, especially in Arctic operations, while L1 organizations must collaborate on cybersecurity and real-time ISR solutions to ensure RPAS platforms deliver robust intelligence capabilities without compromising operational security.

d.   Strategic Joint Staff (SJS), Canadian Joint Operations Centre (CJOC), ADM(Policy), and the RCAF should jointly lead efforts to update doctrine to reflect the unique requirements of RPAS integration. This includes redefining multi-domain command and control processes and establishing clear governance for ethical RPAS use.

e.   JIOC, with input from Canadian Forces Intelligence Command (CFINTCOM) and RCAF, must enhance its capacity for RPAS ISR data PED. Upgrades to PED infrastructure and analytics capabilities will be critical to maximizing the value of RPAS intelligence outputs.

CONCLUSION

8.   The successful integration of RPAS into the RCAF depends on the coordinated involvement of several partners. Addressing challenges in personnel, infrastructure, IT networks, and policy requires a whole-of-organization approach, leveraging the expertise and resources of stakeholders such as ADM(IE), ADM(Mat), and other L1s. By fostering collaboration and aligning efforts with strategic objectives, the CAF can overcome barriers to RPAS integration and fully harness the potential of this transformative capability.

Prepared by: Major Saif Aboud

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