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Expansion of UAS Capabilities for the Canadian Armed Forces – Time for the RCAF to Get Back in the Game

LCol Jonathan Pilon

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SERVICE PAPER - ÉTUDE MILITAIRE

**Expansion of UAS Capabilities for the Canadian Armed Forces –
Time for the RCAF to Get Back in the Game**

LCol Jonathan Pilon

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EXPANSION OF UAS CAPABILITIES FOR THE ROYAL CANADIAN AIR FORCE – TIME FOR THE RCAF TO GET BACK IN THE GAME

AIM

1. The aim of this service paper is to identify roles where Unmanned Aerial Systems or vehicles (UAS/UAV) could be more efficient and/or effective in fulfilling Royal Canadian Air Force (RCAF) missions. Considering the Future Operating Environment, current and forecasted capabilities as well as the challenges of integrating UAS, it is the intent to propose the roles that should be prioritized for future UAS acquisitions. While it is not the intent to recommend specific UAS types or characteristics, these aspects will be in the background of the analysis as they are closely linked to the roles being supported. Also, while some potential roles identified will be applicable to tactical UAS operated by the other CAF components, the focus will be on potential uses involving larger UAS such as High/Medium Altitude Long Endurance (HALE/MALE) operated by the RCAF.

BACKGROUND

2. Since operating the CU-170 Heron in Afghanistan under a lease agreement from 2009 to 2011, the Canadian Armed Forces (CAF) has only employed UAS on a small scale, mainly consisting of tactical UAS in support of the Canadian Army (CA) and Royal Canadian Navy (RCN).¹ The Joint Unmanned Surveillance and Target Acquisition System (JUSTAS) project, recently renamed as the Remote Piloted Aircraft Systems (RPAS) project, has unfortunately faced a number of delays since it was stood up in 2000. Despite the successes with the unmanned

¹ Conrad Edward Orr, “Can unmanned aircraft systems meet Canadian Air Power needs?” *Royal Canadian Air Force Journal* 5, no. 4 (Summer 2016): 16.

platforms operated so far, the RCAF and CAF currently have no established capability beyond tactical UAS.²

3. Canada's latest Defence Policy, "Strong, Secure, Engaged" (SSE), recognized that remotely piloted systems are one of three categories of capabilities that have become particularly critical to modern military operations.³ It also included the intent of investing in medium altitude remotely piloted systems as well as acquiring airborne Intelligence, Surveillance and Reconnaissance (ISR) platforms for Special Operations Forces (SOF).⁴ It is therefore critical for the RCAF to re-invigorate the UAS programme and actively assess its requirements and available options to enhance this capability in the near future.

4. In order to achieve its aim, this service paper uses a number of different articles and recent research carried out on UAS in order to highlight the key factors and challenges that should be taken into consideration when determining the future of UAS for the RCAF and CAF. Based on this research, the paper then proposes the key roles where the new UAS capabilities should be focused on that will provide the best return on investment in supporting the CAF and Canada's objectives.

² Gary Schaub Jr., "JUSTAS for all? Innovation and UAVs in the Canadian Forces," *Defence Studies* 15, no. 2 (June 2015): 124.

³ Department of National Defence, *Strong, Secure, Engaged, Canada's Defence Policy*, (Ottawa: Canada Communications Group, 2017), 70.

⁴ *Ibid.*, 39-40.

DISCUSSION

Future Operating Environment

5. It is first important to highlight elements of the Future Operating Environment (FOE) as these will be relevant in determining the roles that UAS could be most effective in supporting future CAF operations.

6. The increased attention towards the Arctic region is the most important factor which will affect domestic and continental operations for the CAF. “Climate change, combined with advancements in technology, is leading to an increasingly accessible Arctic.⁵” While there is an ongoing debate on the existence of a conventional threat⁶, what is certain is that any increased human activity in the Arctic will require the CAF to be a key partner with Other Governmental Departments (OGD) in providing improved Situational Awareness (SA) through a “Common Operating Picture.⁷” In addition to the Arctic, the RCAF will “contribute to the Whole-of-Government (WoG) system-of-systems persistent surveillance of Canadian territory and air/maritime approaches.⁸”

7. It is difficult to exactly predict what expeditionary missions the RCAF may be called on to support in the future. However, what is certain is that the growing complexity of conflicts will continue, where their nature, whether intra-state or inter-state, will not determine their intensity.⁹

The RCAF must therefore be ready to support CAF operations in all types of conflict, whether

⁵ Department of National Defence, *Strong, Secure, Engaged, Canada’s Defence Policy*, p. 51.

⁶ Whitney P. Lackenbauer, and Adam Lajeunesse, “The Canadian Forces in the Arctic: Building appropriate capabilities,” *Journal of Military and Strategic Studies* 16, no. 4 (2016): 10-11.

⁷ *Ibid.*, 29.

⁸ Department of National Defence, *Future Concepts Directive Part 2: Future Air Operating Concept*, (Ottawa: DND Canada, 15 August 2016), 16.

⁹ Department of National Defence, *Strong, Secure, Engaged, Canada’s Defence Policy*, (Ottawa: Canada Communications Group, 2017), 52-53.

conventional or in a counter-insurgency scenario. “In order to avoid collateral damage, the effect of advances in precision munitions delivered from the air- in conjunction with effective, persistent ISR and targeting capabilities- will continue to be of great advantage in both conventional- or high-intensity- and low-intensity wars.¹⁰” In addition to complex geopolitical relations, global climate change will likely increase humanitarian crises and natural disasters where the RCAF may be called upon to support Canada’s relief efforts.

Challenges

8. There are a number of challenges that need to be understood and taken into consideration with regards to UAS as they will affect the prioritization of either roles and/or capabilities that will be sought.

9. Cost. Whether the platform or role, it is generally recognized that UAS generally offer a cost-benefit over the use of manned aircraft, because of cost per unit as well as cost to operate.^{11,12,13,14} That said, a HALE UAS such as the Global Hawk actually have a unit cost higher than many modern fighter aircraft¹⁵ and require a significant initial investment, potentially requiring the launch of a secure military-communications satellite.¹⁶ While SSE has declared the intent to invest in a MALE UAS for the RCAF, considering the alternative of a HALE UAS could be cost-prohibitive based on other acquisition projects.

¹⁰ Department of National Defence, *Future Concepts Directive Part 2: Future Air Operating Concept*, 11.

¹¹ Michael Tierney, “Acquiring the Drone: Can Canada realistically purchase UAVs?” Accessed 31 Jan 2018, https://cmia-acrm.ca/wp-content/uploads/Tierney_1501.pdf, 1-2.

¹² Conrad Edward Orr, “Can unmanned aircraft systems meet Canadian Air Power needs?”, 19.

¹³ Gary Schaub Jr., “JUSTAS for all? Innovation and UAVs in the Canadian Forces,” 126.

¹⁴ American Security Project, “The US and its UAVs: A Cost-Benefit Analysis,” Posted on 24 July 2012, <https://www.americansecurityproject.org/the-us-and-its-uavs-a-cost-benefit-analysis/>

¹⁵ *Ibid.*

¹⁶ Conrad Edward Orr, “Can unmanned aircraft systems meet Canadian Air Power needs?”, 19.

10. Multi-role requirement. As it was stated by LGen (ret.) Deschamps in a report by the Senate Standing Committee on National Security and Defence, there is a challenge in the fact that UAS technology changes rapidly and finding the “perfect fit” for Canada’s needs. A HALE UAS will be more fitted to the surveillance of large swaths of territory such as the Arctic while a MALE UAS will be required for precision strikes.¹⁷ Since it will unlikely be feasible to afford different systems in the HALE/MALE UAS category, a comprehensive assessment is required to define the type of platforms that may be useful across a wide array of missions.¹⁸ Inversely, determining a prioritization of UAS roles for the RCAF and CAF may assist in selecting the most appropriate platform.

11. Legal and ethical considerations. The use of UAS has sparked many debates amongst the Canadian and foreign public. In the domestic use of UAVs, some concerns revolve around the respect of privacy.¹⁹ Perhaps, the strongest debates however have involved the use of armed UAS, mainly concerning mission creep from surveillance and direct support to “targeted killings”.²⁰ In order to prevent this challenge from being an obstacle to future acquisitions and maintain the legitimacy in the eye of the Canadian public and international community, it will be important to actively advocate the highest standards for use of technologies such as UAS.²¹

¹⁷ Standing Senate Committee on National Security and Defence. *Re-investing in the Canadian Armed Forces: A Plan for the Future*. (Ottawa: Senate, May 2017), 22.

¹⁸ Benoit Arbour, Matthew R. MacLeod, and Sean Bourdon, “Toward Defining Canadian Manned-Unmanned Teaming (MUM-T) Concepts,” *Autonomous Systems, Issues for Defence Policymakers*, Edited by Andrew P. Williams and Paul D. Scharre, (Norfolk: NATO Supreme Allied Command Transformation, October 2015), 265.

¹⁹ Michael Tierney, “Acquiring the Drone: Can Canada realistically purchase UAVs?”, 1.

²⁰ Michael Byers and, Kelsey Franks. “Unmanned and unnecessary: Canada’s proposed procurement of UAVs,” *Canadian Foreign Policy Journal* 20, no. 3 (2014): 272.

²¹ Department of National Defence, *Strong, Secure, Engaged, Canada’s Defence Policy*, 55.

UAS roles for the RCAF

12. Based on the considerations presented and a review of research on the subject of UAS in Canada, the following are the practical roles that should be considered for the next generation of RCAF UAS.

13. Intelligence, Surveillance and Reconnaissance. Perhaps the most appropriate and one of the most plausible roles for future UAS platforms.²² It is also a key capability that the CAF is looking to develop²³ to which UAS would be a significant contribution. There are many different components to this broad mission that needs to be highlighted.

- a. Arctic ISR. Amongst domestic ISR missions, Arctic ISR is likely to be one of the most important that could be supported by UAS. Integrated with the space surveillance capabilities provided by the Polar Epsilon project, MALE or HALE UAS will provide the most effective and efficient solution in the Arctic region.²⁴ As per the description made of the future operating environment in the Arctic, this could include defence missions but will more likely involve a number of non-defence missions in partnership with OGDs, “from tracking ships to monitoring pollution incidents.”²⁵
- b. Maritime ISR. While maritime ISR will certainly be a subset of Arctic missions, it would also apply to all Canadian maritime approaches. As part of the commitment to “expand Canada’s capacity to meet NORAD commitments by

²² Fraser D. Holman, “The Future of Drones in Canada: Perspectives from a Former RCAF Fighter Pilot,” *Strategic Studies Working Group Papers*, (Toronto: Canadian International Council and Canadian Defence & Foreign Affairs Institute, August 2013), 4, 7.

²³ *Ibid.*, 64.

²⁴ Levon Bond, “JUSTAS and Project Epsilon: Integrated Intelligence, Surveillance, and Reconnaissance of the Canadian Arctic,” *Canadian Military Journal* 11, no. 4 (Autumn 2011): 28.

²⁵ Whitney P. Lackenbauer, and Adam Lajeunesse, “The Canadian Forces in the Arctic: Building appropriate capabilities,” 54.

improving aerospace and maritime domain awareness...²⁶”, UAS ISR capabilities can play a critical role. In addition to providing awareness, UAS could play an active role in Anti-Submarine Warfare (ASW), dropping sonar buoys to assist in the detection of submarines.²⁷ While many North Atlantic Treaty Organization (NATO) countries are reducing or eliminating their maritime patrol aircraft fleets²⁸, Canada is looking to replace its CP-140 Aurora fleet with a multi-mission aircraft.²⁹ Although the CP-140, with its modernized ISR suite is capable of carrying out the missions a UAS would such as maritime surveillance, the Canadian fleet has been used extensively being called upon to support overland ISR on Op Impact in addition to its domestic missions. Whatever platform will be chosen to replace the Aurora, while UAS will not replace all functions required of a maritime/multi-mission platform, it may certainly complement this new fleet, reducing acquisition and operating costs. “...Canada’s future maritime surveillance/ISR needs must increasingly be met by a holistic blend of manned aircraft, satellites and UAVs.”³⁰

- c. Expeditionary ISR. The importance of ISR provided by a high-performance UAV to ensure the safety and effectiveness of Canadian troops in combat was recognized in 2008 by the “Manley Report”.³¹ The Heron UAS lease resulting from this report supported 837 missions during the 30-month deployment with no losses, facilitating “ISR and overwatch missions as well as participation in

²⁶ Department of National Defence, *Strong, Secure, Engaged, Canada’s Defence Policy*, 61.

²⁷ Standing Senate Committee on National Security and Defence, *Re-investing in the Canadian Armed Forces: A Plan for the Future*, 21.

²⁸ Martin Shadwick, “The Aurora Chronicles,” *Canadian Military Journal* 14, no. 3 (Autumn 2014): 80.

²⁹ Department of National Defence, *Strong, Secure, Engaged, Canada’s Defence Policy*, 65.

³⁰ Martin Shadwick, “The Aurora Chronicles,” 83.

³¹ Independent Panel on Canada’s Future Role in Afghanistan, *Independent Panel on Canada’s Future Role in Afghanistan*, (Ottawa: Public Works and Government Services, 2008), 38.

targeting weapons carried by other platforms and conducting battle damage assessment afterward.³² Once again, governmental reports recently highlighted the importance of ISR provided by UAS to protect Canadian troops when deployed³³, and the development of targeting capabilities is an objective highlighted in SSE.³⁴ In addition to the protection of troops on the ground, the UAS would allow to perform the ISR function without needlessly exposing aircrew and manned aircraft to enemy threats.

14. Precision strike. As discussed at para 11, this role is a cause of debate but cannot be ignored in terms of future UAS capabilities. While not relevant to domestic missions and argued by some that this capability can be provided by coalition partners when deployed³⁵, the ability to provide this function independently or even in support to coalition partners must be considered. As opposed to traditional manned aircraft, UAS can add persistence to the capability of finding and striking from a distance.³⁶ The potential of UAS in a Close Air Support (CAS) role then becomes interesting, providing the same coverage that would be provided by multiple sorties of fighter aircraft with many less airframes.³⁷ Perhaps an iterative approach could be taken with this role if needed, maintaining the weapons delivery capability as a requirement for a UAS platform without necessarily exercising this option immediately. “Combat capable platforms can be used

³² Gary Schaub Jr., “JUSTAS for all? Innovation and UAVs in the Canadian Forces,” 133.

³³ Standing Senate Committee on National Security and Defence. *Re-investing in the Canadian Armed Forces: A Plan for the Future*, vii.

³⁴ Department of National Defence, *Strong, Secure, Engaged, Canada's Defence Policy*, 66.

³⁵ Fraser D. Holman, “The Future of Drones in Canada: Perspectives from a Former RCAF Fighter Pilot,” 7.

³⁶ Gary Schaub, and Kristian Soby Kristensen, “But Who's Flying the Plane? Integrating UAVs into the Canadian and Danish Armed Forces,” *International Journal* 70, no. 2 (2015): 253.

³⁷ Stout, Jay, “Cas: Using Armed Uavs?” *United States Naval Institute. Proceedings* 131, no. 7 (2005): 4-5.

for non-combat missions whereas the reverse is not true.³⁸ Also to consider is that payload delivery capability may also be useful in non-defence roles.

15. Other roles. There are a number of other practical roles, although likely secondary, where UAS would be able to provide valuable support.
- a. Humanitarian Relief. In addition of Intelligence collecting in a defence role, UAS could provide this function in support of humanitarian relief and post-disaster efforts. UAS could complete reconnaissance flights, gathering valuable information on the terrain and travel routes, allowing rotary-wing assets to focus on tasks requiring personnel and equipment movement.³⁹
 - b. Search-and-Rescue (SAR). Another recommended domestic use of UAS is in support of SAR, whether overland including the Arctic or in the maritime environment.⁴⁰ Because of the same quality of persistence that it brings to ISR, UAS may be useful in searching large portions of territory for which the RCAF provides SAR support as well as dropping Survival Kit Air Droppable (SKAD) if equipped to deliver payload.⁴¹
 - c. Communications Relay. Perhaps secondary to providing an ISR capability in the Arctic, a plausible role of UAS would be as a communications relay⁴², acting as a node in an area where communications may be challenging.

³⁸ Alan Stephenson, "The RCAF and the Role of Airpower: Considering Canada's Future Contributions," *2016 Policy Review Series*, (Calgary: Canadian Global Affairs Institute, July 2016), 5..

³⁹ Michael Tierney, "Acquiring the Drone: Can Canada realistically purchase UAVs?," 1-2.

⁴⁰ Standing Senate Committee on National Security and Defence. Re-investing in the Canadian Armed Forces: A Plan for the Future, 21-22.

⁴¹ Whitney P. Lackenbauer, and Adam Lajeunesse, "The Canadian Forces in the Arctic: Building appropriate capabilities," 54.

⁴² Fraser D. Holman, "The Future of Drones in Canada: Perspectives from a Former RCAF Fighter Pilot," 7.

- d. Manned-Unmanned Teaming. Not a role in itself and likely not a concept that will be applied in the current generation of UAS but deserves to be acknowledged is Manned-Unmanned Teaming, which implies a higher level of integration of UAS operating with manned aircraft. In addition to the traditional sensor role, a study showed there could be usefulness of employing UAS for Electronic Attack or Decoy in support of fighter operations, including for training purposes.

CONCLUSION

16. There are a number of practical roles where UAS could complement or replace current RCAF capabilities, making operations more effective and/or efficient. These roles are driven by an FOE that will continue to add complexity to the operations the CAF will be called upon to support. The geopolitical environment will continue to create risk for intra-state as well as inter-state conflicts. The changing climate may increase humanitarian crises and natural disasters at home and abroad while opening up the Arctic to greater human activity. In this environment, the RCAF must be ready to conduct its missions and support all other CAF components. The UAS is an important capability that has been underexploited by the RCAF since the end of the mission in Afghanistan. While there continues to be success in integrating tactical UAS within the CA and RCN as well as SOF, the RCAF does not currently own or operate a MALE/HALE capable UAS that could add value in numerous roles. With the renewed intent to procure additional UAS in SSE and the transition of JUSTAS to RPAS, it is the opportunity to re-invigorate the acquisition of a greater UAS capability for the RCAF. In determining the potential roles and acquisition of UAS, there are a number of challenges that need to be acknowledged which are to determine the best multi-role platform to meet the RCAF and CAF requirements while balancing costs which

can remain significant for some UAS. There is also an on-going debate on the use of armed UAS that needs to be recognized and engaged openly to ensure proper advocacy and messaging of legitimate and legal use. However, managing all these could allow UAS to greatly increase ISR capabilities at home and abroad, with the potential to carry out precision strike in combat operations. They could also support a number of other non-defence missions to include humanitarian assistance and SAR.

RECOMMENDATIONS

17. While it was not the purpose of this service paper to identify the type and characteristics of UAS to be procured, the roles identified herein should be used as a basis to determine the capabilities required. While the intent to acquire a MALE UAS as identified in SSE should typically be capable of carrying out the roles identified, Arctic surveillance may prove more challenging. However, technology evolves rapidly in this domain and there may be MALE UAS that will nevertheless offer added value and capability in this challenging environment. Canada should also turn to allied nations to observe their experience with recent acquisitions such as Australia, which may be relevant in identifying future UAS acquisitions.⁴³

⁴³ Conrad Edward Orr, "Can unmanned aircraft systems meet Canadian Air Power needs?", 20-21.

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