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UAV CAPABILITIES: CANADA'S ANSWER FOR AEROSPACE POWER

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AIM

1. In light of the impact that global warming is having on Canada's northern border as well as the prevalence of increased Arctic activity, it is becoming more important than ever that Canada takes measures to display and maintain sovereignty of Canada's Arctic. One way in which to achieve this is through dedicated command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR). The aim of this service paper is to recommend utilization of unmanned aerial vehicles (UAVs) in order to fulfill this capability.

INTRODUCTION

2. "Promoting and protecting national interests is the essence of national security, which is inherently the ultimate responsibility of government and is achieved through the adoption of a coherent National Security Policy."[1] A background brief that was prepared for the Canadian Senate outlines that "with a coastline of 150,000 miles and an area of responsibility over 6.7 million miles, Canada has a formidable challenge in addressing maritime security."[2] While the background brief by Capt(N) Hickey does identify that a high level of awareness has been achieved by combining government and commercial agency data sources, it also indicates that the picture is still limited. As a result, it recommends that more surveillance is required to improve the timelines in data collection thereby ensuring that Canada's interests are fully

[1] Department of National Defence, B-GA-400-000/AF-000, *Canadian Forces Aerospace Doctrine*. (Ottawa: DND Canada, 2010), 17.

[2] Capt(N) Laurence Hickey, "Background Brief - The Recognized Maritime Picture*."* Presentation, Senate Committee for National Security and Defence, Ottawa, ON, Sept/Nov, 2003, http://www.parl.gc.ca/Content/SEN/Committee/372/defe/witn/hickey2-e.htm

protected.[3] The Canadian Armed Forces (CAF) has fulfilled this requirement in part through reliance upon airpower, specifically the CP-140 Aurora and CF-18 Hornet. However, if additional reconnaissance and surveillance efforts are required and with focus more than ever directed towards cost effective measures to reduce defence expenditures, it is an opportune time to take advantage of the technological advancements that UAVs can provide.

3. The following paragraphs will outline the various capabilities that UAVs can provide as well as how their capabilities can assist in achieving Canada's national defence responsibilities. Specifically, one UAV, the MQ-4C Triton will be reviewed by applying its attributes to aerospace power characteristics and applications as listed within Canadian Forces Aerospace Doctrine.

DISCUSSION

4. Within the Minister of National Defence Mandate Letter, the Prime Minister has directed that the Minister of National Defence, "renew Canada's focus on surveillance and control of Canadian territory and approaches, particularly our Arctic regions, and increase the size of the Canadian Rangers."[4] With the anticipated opening of the Northwest Passage and associated increase to maritime trade and air traffic, Canada may very well need to augment its maritime aviation security in order to adequately monitor the vast borders, national waters and airspace. In its role of protecting Canada's national interests, the Royal Canadian Air Force (RCAF) may be called upon to also provide the necessary surveillance and assistance to other entities when and as required through use of its air capabilities. However, one could question whether the aerospace powers that the RCAF currently possesses are sufficient in numbers and capability.

[3] *Ibid.*

[4] Office of the Prime Minister, *Minister of National Defence Mandate Letter* (Ottawa, ON, 2015), http://pm.gc.ca/eng/minister-national-defence-mandate-letter

5. In order to fulfill the requirement to protect Canada's national interest, we must remain cognizant of the fact that as technology in relation to aerospace power has progressed, we are now seeing changes in how aerospace power can be employed due to the improved characteristics of new aerospace systems. This also has new implications for Canada's defence capabilities. As per Colonel Jeffrey Smith, Commandant and Dean of the School of Advanced Air and Space Studies (SAASS), Maxwell Air Force Base Air University; while speed has inherently been included within airpower strategy, it cannot be assumed that speed will be the answer to future technology advances and targeting capabilities. In fact, it may be difficult to achieve and sustain air superiority due to the technological advancements. Advantage will need to be secured through the speed at which we can receive ISR data, assimilate the data into useable information and synthesize and determine applicable actions to outmaneuver enemies.[5]

6. Due to the rapid advancement of technology and the need for ISR capability, we are now seeing the proliferation of UAV or drone employment by many countries. "Over 90 countries and non-state actors operate drones today, including at least 30 that operate or are developing armed drones."[6] UAVs are varied in their size and application. As outlined by Kelley Sayler, associate fellow at the Center for a New American Security, UAVs for military application can grouped into three categories:

a. Midsize military – these systems are generally used for surveillance purposes;

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[5] Jeffrey J. Smith, "Beyond the Horizon: Developing Future Airpower Strategy." *Strategic Studies Quarterly* 8, no. 2 (Summer 2014): 91, http://www.au.af.mil/au/ssq/digital/pdf/summer_2014/smith.pdf.

[6] Kelley Sayler, "A World of Proliferated Drones: A Technology Primer," *Center for a New American Security*, (June 2015): 3, http://www.cnas.org/search/site/A%20World%20of%20Proliferated%20Drones%3A%20A%20Technology%20Primer.

b. Large-military specific – these UAVs provide greater range, endurance and payload capacity. Due to their technological sophistication, many can provide beyond-line-of-site communications and signal jamming; and

c. Stealth combat drones – these contain highly sophisticated technologies, such as the ability to remain less detectable.[7]

7. As detailed by Michael Heatherly, doctoral student, Valdosta State University, while benefits of UAVs will be dependent upon operational objectives, there are some features that could benefit all users. In addition to decreased manpower, there are benefits directly related to personnel. Manned aircraft cannot stay aloft because of limitations imposed by the aircraft and operator. These relate to fuel requirements and operator limitations associated with flight time fatigue as well as requirements for nourishment and lavatory breaks. In comparison, UAVs are unmanned and can stay aloft for several hours. The Predator B, in particular, can stay aloft for twenty hours. As a result, greater operational capability is achieved when there is the ability to rotate on duty personnel and breaks can be taken without interrupting ongoing operations.[8] The ability to rotate personnel as required and to maintain continuous operations without aircraft related limitations, would allow focus and efforts to remain on the information that is being provided by the UAV.

8. The increased use of UAVs can also be linked to less risk to the operator(s). According to senior fellow, Micah Zenko, drones have become an important tool against terrorist and militant organizations, due to their ability to silently observe an individual, group, or location over long periods. Their ability to also take immediate action without putting the pilot at risk has enabled

[7] Ibid.: 5-6.

[8] Michael C. Heatherly, "Drones: The American Controversy." *Journal of Strategic Security* 7, no. 4 (2014): 28, http://scholarcommons.usf.edu/jss/vol7/iss4/4.

the United States to destroy the leadership of al-Qaeda and disrupt the activities of other militant groups.[9]

9. In addition to the important operational efficiencies, within today's climate of fiscal restraint, cost efficiencies are also key considerations. As per Heatherly, an example of a cost comparison was conducted by the United States (US) Government Accountability Office. This study analysed the costs to operate both manned and unmanned aircraft utilized during Customs and Border Protection operations. The findings indicated that the Blackhawk helicopter operated at an average cost/hr of $5,233.15 while Predator B, unmanned aircraft, was $3,234. Both costings included fuel and maintenance costs associated with the aircraft. As well, both platforms were used for similar missions. While the Predator B was unable to deliver personnel, it is clear that significant savings were achieved.[10]

10. Canada's involvement in North American Aerospace Defense Command (NORAD) and North Atlantic Treaty Organization (NATO) also reinforces the important relationship that Canada maintains with the US. In accordance with the Canadian Forces Aerospace Doctrine, "to facilitate interoperability, CF military doctrine must be as consistent as possible with the doctrine of the United States (US) and other NATO members."[11] In relation to this, we will need to consider US capabilities and how these capabilities are evolving in order to maintain interoperability. As per the Minister of National Defence Mandate Letter, the Prime Minister listed as one of his top priorities, the requirement to "maintain Canada's strong commitments to the North American Aerospace Defence Command (NORAD) and to the North Atlantic Treaty

[9] Micah Zenko, "Reforming U.S. Drone Strike Policies," *Council on Foreign Relations* Council Special Report no. 65, (Jan 2013): vii, www.cfr.org/wars-and-warfare/reforming-uzsz-drone-strike-policies/p29736.
[10] Heatherly, "Drones: The American Controversy."…, 29.
[11] Department of National Defence, *Canadian Forces Aerospace Doctrine*…, 3.

Organization (NATO)."[12] In order to achieve this, then perhaps Canada should also be considering those capabilities that the United States is currently and forecasted to use to meet their surveillance and reconnaissance objectives for national defence.

11. In order to fulfill its national defence requirements, the United States is currently increasing its use of military-specific UAVs. One UAV in particular is the Northrop Grumman's RQ-4 Block 40 Global Hawk, which "operate active electronically scanned array radars that deliver higher resolution than that available in baseline systems, as well as integrated sensor suites that synthesize inputs from the system's radar, cameras, and other sensors."[13] As a result, the RQ-4 Global Hawk can conduct air-to-air surveillance as well as track individuals and ground vehicles.[14] While the United States has utilized the Global Hawk for many years, recently the Navy has changed its focus towards another Northrop Grumman unmanned aircraft system (UAS), the MQ-4C Triton. According to Naval Technology, this is a variant of the RQ-RB Global Hawk that is more in line with the maritime requirements, hence, it is called the MQ-4C Triton Broad Area Maritime Surveillance (BAMS) UAS.[15]

12. The aerospace power characteristics that are inherent within this UAS have made it a sought after capability for the Navy's maritime role as the MQ-4C Triton UAS is "suitable for conducting continuous sustained operations over an area of interest at long ranges. It relays maritime intelligence, surveillance and reconnaissance (ISR) information directly to the maritime commander."[16] In order to determine how this system fulfills the various aerospace power

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[12] Office of the Prime Minister, *Minister of National Defence Mandate Letter* (Ottawa, ON, 2015), http://pm.gc.ca/eng/minister-national-defence-mandate-letter.

[13] Sayler, "A World of Proliferated Drones: A Technology Primer"…, 20.

[14] *Ibid*.

[15] Naval Technology, "MQ-4C Triton Broad Area Maritime Surveillance (BAMS) UAS, United States of America," last accessed 2 February 2016, http://www.naval-technology.com/projects/mq-4c-triton-bams-uas-us/.

[16] *Ibid*.

characteristics as presented within the Canadian Forces Aerospace Doctrine, the data provided by the Naval Technology project information site will be reviewed and linked with various aerospace power characteristics:

a. Elevation – this UAV can fly up to a maximum altitude of 60,000 ft;

b. Fragility - strengthened forward fuselage to the protect the various sensors;

c. Impermanence – can fly 24 hours a day, seven days a week. If unfueled, it has a range of 9,950 nautical miles and can fly for 30 hours;

d. Payload – internal payload of 1,452kg and external payload of 1,089kg;

e. Precision – the Naval-technology project information outlines the following sensors:

(1) FOR – 360-degree field of radar sensors;

(2) MFAS- multifunction active sensor;

(3) Electronically steered array radar;

(4) EO/IR – electro-optical infrared sensor;

(5) AIS – automatic identification system receiver;

(6) ESM – electronic support measures;

(7) Communications relay equipment;

(8) Link-16;

(9) MTS-B – multispectral targeting system (high resolution imagery and full motion video);

(10) AN/ZLQ-1 ESM – tracks and detects emitters of interest;

f. Reach – it has a maritime surveillance and reconnaissance coverage radius of 2,000 nautical miles;

g. Sensitivity to Environment Conditions - radomes provide protection from lightening, hail and bird-strikes;

h. Speed – 357mph; and

i. Support Dependency – according to the project information provided by Naval Technology, the MQ-4C Triton is operated by four-man crews (air vehicle operator, mission commander and two sensor operators). The ground station includes the following:

(1) Launch and Recovery Element – responsible for ground support equipment and landing/take-off operations; and

(2) Mission Control Element – responsible for mission planning, coordinating launch and recovery, image analysis and monitoring of communications.[17]

13. In order to achieve its national objectives, the US is planning to use the MQ-4C Triton UAS for various applications including "maritime surveillance, battle damage assessment, port surveillance, and communication relay. It will also support other units of naval aviation to conduct maritime interdiction, anti-surface warfare (ASuW) battle-space management and target missions."[18]

14. The capabilities that the MQ-4C Triton UAS is anticipated to provide has caught the interest of Australia as well. As per Flight Global Aviation Connected, Australia is also considering procurement of the MQ-4C UAS and is awaiting the outcomes of the US Navy's

[17] Naval Technology, "MQ-4C Triton Broad Area Maritime Surveillance (BAMS) UAS, United States of America," last accessed 2 February 2016, http://www.naval-technology.com/projects/mq-4c-triton-bams-uas-us/; Department of National Defence, B-GA-400-000/AF-000, *Canadian Forces Aerospace Doctrine*. (Ottawa: DND Canada, 2010), 25-26.

[18] Naval Technology, "MQ-4C Triton Broad Area Maritime Surveillance (BAMS) UAS, United States of America," last accessed 2 February 2016, http://www.naval-technology.com/projects/mq-4c-triton-bams-uas-us/.

development program before they make their final determination.[19] According to Prime Minister Tony Abbott, "these aircraft will patrol Australia's vast ocean approaches, and work closely with other existing and future Australian Defence Force [ADF] assets to secure our ocean resources, including energy resources off northern Australia, and help to protect our borders."[20]

15. For Canada, the capabilities integral to the MQ-4C would provide aerospace power that is suitable for the following applications:

a. Support – the speed and reach that the MQ-4C could provide would be suitable for Canada's large border expanse;

b. Observation – it will enable advanced sense capabilities associated with surveillance and reconnaissance and will provide real time dissemination through satellite to the Combined Air Operations Centre (CAOC) for intelligence and target analysis; and

c. Presence – it will provide a persistent presence of our Arctic and border region.

16. While UAVs are a relatively new technology and one that has not yet been progressed in Canada, there are various proponents who see the benefits of this capability. Ernie Regehr, Senior Fellow in Arctic Security at The Simons Foundation, and Research Fellow at the University of Waterloo, has indicated that some have suggested that drones would be utilized

> for tracking civilian aircraft and for assisting in maritime patrols (including of the kind now conducted by the civilian National Aerial Surveillance Program operated by Transport Canada), search and rescue, and other concrete contributions to public safety in Canada.[21]

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[19] Flight Global Aviation Connected, "Australia to buy MQ-4C Triton," last modified 13 March 2014, https://www.flightglobal.com/news/articles/australia-to-buy-mq-4c-triton-396964/.

[20] *Ibid*.

[21] Ernie Regehr, "Disarming Arctic Security: Fighter Aircraft and the New Canadian Defence Imperatives." *The Simons Foundation*, (January 2016): 3, http://www.thesimonsfoundation.ca/sites/all/files/Fighter%20Aircraft%20and%20New%20Canadian%20Defence%20Imperatives%20-%20DAS%2C%20January%207%2C%202016.pdf.

17. If the Prime Minister has directed a replacement option be sought for the CF-18, one "focusing on options that match Canada's defence needs"[22], then perhaps the MQ-4C Triton UAS is a promising option. The intrinsic capabilities of "SIGNET (signals intelligence), C4ISR and maritime strike capabilities"[23] could very well enable it to be a key aerospace power asset. In this regard, it can be "integrated with land and maritime forces to contribute to joint and combined operations, or it can be integrated in a WoG or comprehensive approach."[24]

18. Unfortunately, as with any new technology, especially one which may have already received bad publicity regarding its use, there could be challenges in garnering public support. As a result, any future procurement should also consider the benefits to be gained by also incorporating a strategic public affairs awareness plan to reinforce the positive aspects of the aerospace capabilities associated with this particular UAS and why it would be of benefit to Canada's national defence interests.

CONCLUSION

19. One of the priorities that the Prime Minister of Canada has listed is the Defence of Canada's national interests. The challenges inherent with this are related to Canada's vast borders, maritime waters and airspace. With its vast border and maritime expanses, the US has been very much focused on utilizing the technological advances associated with UAVs. In particular, the US is now looking towards the UAS capability of the MQ-4C Triton to assist in its broad maritime surveillance requirements. This UAS has the necessary aerospace power characteristics that would enable it to fulfill some key aerospace applications. Based upon the

[22] Office of the Prime Minister, *Minister of National Defence Mandate Letter* (Ottawa, ON, 2015), http://pm.gc.ca/eng/minister-national-defence-mandate-letter.

[23] Naval Technology, "MQ-4C Triton Broad Area Maritime Surveillance (BAMS) UAS, United States of America," last accessed 2 February 2016, http://www.naval-technology.com/projects/mq-4c-triton-bams-uas-us/.

[24] Department of National Defence, *Canadian Forces Aerospace Doctrine…,* 18.

MQ-4C Triton development program outcomes, Australia is also considering procurement of this UAS in order to patrol their vast ocean approaches.

RECOMMENDATION

20. When one considers the anticipated increase of air and maritime traffic in the Arctic, perhaps now is a suitable time to review the capabilities that are currently present and determine ways in which to augment these capabilities. The MQ-4C Triton UAS would help to not only meet the demands imposed by a changing northern environment but would achieve interoperability with the US and provide aerospace functions that could benefit various national entities, which would foster a Whole of Government approach.

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