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Canadian Airborne Early Warning and Control: Convening Command and Control for NORAD and NATO

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CANADIAN AIRBORNE EARLY WARNING AND CONTROL: CONVENING COMMAND AND CONTROL FOR NORAD AND NATO

Introduction

The Canadian Armed Forces (CAF) does not currently have the means to constantly detect, identify and track airborne or maritime threats outside the North Warning System (NWS) and the Canadian Coastal Radar coverage. Additionally, much of Canada's sovereign territory within the Canadian Air Defence Identification Zone (CADIZ) is unmonitored by ground-based radar. The Royal Canadian Air Force (RCAF) does not possess the capability to detect or counter the emerging threats from a more assertive and aggressive Russia in the Arctic and outer coastal regions.

Airborne reconnaissance and the situational awareness that it can provide commanders has been a vital aspect of modern warfare since World War Two[1]. The concept of airborne early warning (AEW) aircraft fused with an organic control capability has enabled airborne early warning and control (AEWC) platforms to perform as a joint Command and Control (C^2) node that is both survivable and flexible. Furthermore, the capability is viewed as essential for a modernized NORAD to meet current and emerging threats and will meet the Government of Canada's commitment under Strong, Secure, Engaged (SSE) to detect, deter and defend "at any given time," against threats to Canada's territory and approaches.[2]

In tandem with NORAD employment, AEWC capability has the potential of messaging Canada's commitment to Arctic sovereignty with its air and maritime domain

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[1] (Gibson, Chris. 2020. "Book Review - THE ADMIRALTY AND AEW: ROYAL NAVY AIRBORNE EARLY WARNING PROJECTS." *RCAF Journal - SPRING 2020 - Volume 9, Issue 2*, Spring)

[2] (Canada. Department of National Defence. 2017. "Strong, secure, engaged : Canada's defence policy." Government of Canada. Accessed November 24, 2021. https://publications.gc.ca/site/eng/9.835971/publication.html. 17)

surveillance abilities. Furthermore, the ability to deploy globally will allow Canada's commitment to NATO, the UN, and other organizations to be further demonstrated. Government of Canada policy is to maintain the rules based international order and employment of in-demand AEWC assets would go some way to deflect criticism of not meeting the NATO two percent GDP defence budget target.

This essay will argue that AEWC is vital to meet future Canadian Government national security, defence, and foreign policy requirements. Furthermore, the capability must be integrated with future CAF weapons systems and compatible with allied nations to ensure Canada remains relevant within the international rules-based order.

Why AEWC is Important

Since its introduction and decisive impact on the outcome of the Battle of Britain, radar has proven to be vital to the successful employment of airpower. Likewise, airborne surveillance has a similar pedigree; the German battleship Bismarck was engaged and sunk only after being detected by a Royal Air Force (RAF) spotter aircraft while she attempted to evade the Royal Navy (RN) Home Fleet. Two years later, in the Pacific theater, American Catalina aircraft spotted the Japanese fleet at Midway and enabled a decisive United States Navy (USN) victory.[3] The importance of AEW capability was again demonstrated in 1982 when the RN Task Force to recapture the Falkland Islands suffered significant loss of escort, cargo carriers and troop ships at the hands of Argentine air strikes. The lack of British AEW is a well-documented lesson

[3] (Gibson 2020)

from Operation Corporate, and the RN lost two Type 42 Destroyers trying to mitigate the threat caused by the capability gap. [4]

AEW quickly developed an "air-controlled interception" capability and this in turn evolved to integrating pan-domain C^2 that can either take the place of or assist ground-based control and reporting centre (CRC) functions. The addition of this organic control capability to AEW has seen aircrew provide air traffic and battle management services for a wide range of operations. Air policing, evacuations, crisis response, embargo enforcement and surveillance operations all benefit from AEWC as well as offensive and defensive counter air campaigns. [5] AEWC platforms with advanced radar systems can track targets at staggering distances; three aircraft in overlapping orbits can provide complete radar coverage of all of Central Europe. [6] Air Force doctrine has incorporated AEWC assets where tactical control of operations in routinely delegated to the crews of these aircraft. AEWC platforms support of ground elements have also been vital in recent operations, with embedded Joint Terminal Attack Controllers (JTACS) directing close air support missions.

The world is transitioning to a new era of security challenges. Traditional C^2 structures will be under pressure to shorten decision making times and dynamic targeting will become highly important.[7] AEWC provides decision makers, both military and political, with unparalleled flexibility to rapidly establish or expand C^2 to enhance

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[4] (Shields, John. 2021. Air Power in the Falkands Conflict. Barnsley: Pen & Sword Books Ltd, 190)
[5] (CHAPMAN, KHALEM. 2018. "Airborne Early Warning and Control: Detecting the Battlespace." Royal Aeronautical Society. September 18. Accessed April 2022. https://www.aerosociety.com/news/airborne-early-warning-and-control-detecting-the-battlespace/. 4)
[6] (CHAPMAN, 6)
[7] (Aksu, Maj Osman. 2021. "Delivering NATO Air & Space Power at the Speed of Relevance." Joint Air Power Competance Centre. September. Accessed April 2022. https://www.japcc.org/?s=Delivering+NATO+Air+%26+Space+Power+at+the+Speed+of+Relevance.)

Air and Space power and message commitment to allies. The inherent flexibility and versatility of airpower allows rapid deployment and redeployment of assets that supports the full spectrum of conflict.[8] This tenant of airpower, when applied to AEWC capability, greatly enhances the survivability of the C^2 system, as it is highly mobile, and not susceptible to long range attack that some ground-based control and reporting centres are vulnerable to.

Initiative Sixty-Seven in Canada's defence policy, SSE, has committed to acquire "next generation surveillance aircraft"[9] that will complement the promise to modernise NORAD to meet existing challenges and evolving threats[10] by the provision of flexible and mobile airborne Intelligence Surveillance and Reconnaissance (ISR), C^2, and response capabilities. This capability must, primarily be well suited for the defence of Canada and the defence of North America but must be suitable for expeditionary peace and stability missions around the globe in support of the CAF's core missions.[11] By obtaining a modern AEWC capability, the RCAF and the CAF will meet the direction given in SSE, with an agile, interoperable, long-range early detection platform to enhance the defence of both NORAD and national operations. Furthermore, the RCAF would be independent of limited allied AEWC aircraft for the conduct of Canadian northern territorial defence operations, while CAF commitments to burden share with allies would be greatly enhanced. An AEWC capability would be valuable to the wider CAF,

[8] (Royal Canadian Air Force. 2016. Royal Canadian Air Force Doctrine. Ottawa: Ministry of National Defence, 22)
[9] (Canada. Department of National Defence 2017, 110)
[10] (Canada. Department of National Defence 2017, 90)
[11] (Canada. Department of National Defence 2017, 17)

supporting land and maritime domains, and Special Forces operations that range from high intensity anti-access/area-denial conflicts to peacekeeping stability operations.

Threats, Requirements and NORAD Modernization

An increasingly aggressive Russia, combined with the melting Arctic ice are both presenting threats to Canada and NATO. As lucrative commercial sea lanes prompt Russian military buildup within the region, in parallel with increased interest from China in the arctic, Canada, NATO and allied partners have committed to invest in regional force structure, doctrine, and command, control, communications, and intelligence (C^3I) infrastructure.[12] In order to defend Canada's interests in the Arctic the CAF must maintain surveillance and control of its territory. In addition to long-range bombers and fighter interceptors, Russia and other peer adversaries have developed advanced weapons systems that challenge current NORAD and alliance capabilities to detect, classify, identify, track and engage, both domestically and expeditionary.[13] Defending against these threats will require detection at long range with an agile, state-of-the-art early warning and control system of systems to provide decision makers with timely, accurate and complete situational understanding. A Canadian AEWC capability will strengthen commitment to NORAD, and along with other future CAF weapons systems, contribute

[12] (Dorschner, James. 2020. "High North: NATO and Russia expand into the Arctic." Janes. February 13. Accessed April 2022. https://customer-janes-com.cfc.idm.oclc.org/janes/search?q=High%20North%3A%20NATO%20and%20Russia%20expand%20into%20the%20Arctic&pg=1.)

[13] (Bronk, Justin. 2014. "NATO Baltic Air Policing – Revenge of the Cold WarRelic." The Royal United Services Institute. June 4. Accessed April 2022. https://www.rusi.org/publication/nato-baltic-air-policing-revenge-cold-war-relic.)

to a strong force package for use in continental defence, NATO/UN operations and national expeditionary operations.

The Cold War era NWS no longer provides the early warning necessary against state-of-the-art threats. This lack of warning highlights the requirement to expand Canada's capabilities to meet national and NORAD defence commitments by ensuring a sovereign ability to detect, deter and defend against all threats that enter the CADIZ.[14] The US provides all of the AEWC capability to the current NORAD surveillance system, which makes the RCAF dependent on allies to monitor the entire CADIZ. An organic AEWC platform would eliminate this reliance, while creating opportunities for Canada to contribute highly desirable assets to international peace and security by burden sharing with allied missions. Any AEWC capability must be able to fuse the data generated by on-board systems with the wider surveillance system. In the case of NOARD, advances in over-the-horizon radar, space-based surveillance and traditional radar data will be combined with AEWC returns to produce the recognized air and maritime picture required to defend the North America. Similarly, for expeditionary operations, the real-time flow of information among multiple interconnected platforms and operational headquarters, across multiple nationalities is necessary to contribute to a networked allied air and maritime defence system.

Although the primary mission for a Canadian AEWC platform would be focused on NORAD and continental defence, expeditionary operations will be tasked by the Government of Canada to support allies. Following the Russian annexation of the Crimea in 2014 and the invasion of Ukraine in 2022, air policing of NATO's eastern

[14] (Canada. Department of National Defence 2017, 80)

flank has been a priority for the alliance. As part of this commitment, Canada deploys CF18 fighters episodically to Romania and relies upon NATO C^2 assets.[15] Likewise, Canadian commitment to support the UN sanctions imposed on North Korea sees CP140 maritime patrol aircraft deployed episodically to Japan where it is supported by USN and allied C^2. Maintaining an accurate air and maritime picture in these operations is vital to the successful outcome of the missions, and in supporting the aims of the Government of Canada. Situational and intelligence superiority over adversaries in these instances is vital to commanders, as misjudgment and lack of timely intelligence can lead to diplomatic incidents or worse. It is highly important that AEWC is compatible with all allied C^2 systems and platforms as unique to Canada systems will be problematic to integrate with NATO and allied partners.

A Canadian AEWC platform must be compatible with future RCAF, RCN and continental defence projects. Future fighter, replacement tanker, future maritime patrol, NORAD modernization and Type 26 Frigate are all complex weapon systems programs that must be compatible with an AEWC capability. Sensor range, coverage, commonality, integration, and fidelity are the major requirements that must drive the selection of a future platform. But, endurance, speed, altitude crew size, and life cycle costs are also factors that will influence the choice of AEWC aircraft. Longer station time is highly important, and the ability to refuel while airborne will be a significant force multiplier while reducing the need to improve infrastructure to be able to support the aircraft. Commonality of mission systems and parts with other RCAF and allied fleets is also an important factor that will reduce interoperability conflicts and reduce overall life-

[15] (Bronk 2014, 3)

cycle costs; this will also allow the possibility of entering into a consortium of users that share data and parts much like the support system for C17 and F35 users. Pan-domain interoperability is also key to future operations; data linking and information sharing among other C^2 nodes, and the exploitation of Space and Cyber data will become increasingly important in the future of the AEWC mission set.

Canada's Options

While Canada is yet to release a formal updated national security policy[16] or an updated foreign policy, Deputy Prime Minister Freeland outlined foreign policy priorities in 2017, and signaled that the CAF would "step up" to strengthen the global order through the use and application of military power.[17] An organic Canadian AEWC capability has the ability to reinforce the Canadian government's commitment to arctic sovereignty, NATO, global governance and the international rules based order, by committing C^2 assets and expertise that is in demand across the NATO alliance. Furthermore, the capability can be presented as being defensive and non-kinetic, which aligns with the current government's policies of avoiding combat missions such as the CF188 contribution to Operation IMPACT in 2014.[18] The prestige of committing such an important asset, vice contributing to a jointly owned capability, such as the NATO Airborne Early Warning and Control Force, has almost endless media operations benefits

[16] (Canada. Privy Council Office. 2004. Securing an Open Society : Canada's National Security Policy. Ottawa: Privy Council Office.)
[17] (Global Affairs Canada. 2017. "Address by Minister Freeland on Canada's foreign policy priorities." Global Affairs Canada. June 6. Accessed October 13, 2021. https://www.canada.ca/en/global-affairs/news/2017/06/address_by_minister_freeland.)
[18] (Light, Robert. 2015. Canada's mission against ISIS. December 7. Accessed May 11, 2022. https://canpol.wordpress.com/2015/12/07/canadas-mission-against-isis/?msclkid=5b396f82d12b11ec8c7fae48151f221d.)

and would provide opportunities to message government intent to adversaries and Canadians alike, with little risk to Canada or CAF members.

In a similar fashion, the employment of in-demand AEWC platforms to NORAD and NATO would go some way to deflect international criticism of the Canadian government's failure to commit to the NATO defence spending target of 2% of national Gross Domestic Product. Routine, yet episodic, deployment of AEWC aircraft would be a highly visible and effective means of showing commitment to NATO, and is in line with Canada's narrative that "participation of the Canadian Armed Forces on NATO missions as an equally valid measurement of contribution to the Alliance".[19] Investment in and employment of, AEWC would provide further substation to the governmental position that Canada is fully committed to NATO despite its small defence budget.

As a Pacific nation, Canada has a vested interest in the balance of power in the Indo-Pacific region. A more assertive and aggressive China has challenged the international rules-based order and has sought to control much of the South China Sea and aims to reunite Taiwan with China, by force if necessary[20]. AEWC in the region to provide an accurate C^3I picture of Chinese air and maritime activity will be vital to maintaining the status quo in the region and countering potential large-scale aggression against sovereign nations in the South China Sea region. Canadian contribution to this activity would open the possibility of closure involvement with the AUKUS security

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[19] (Overton, Matthew. 2017. DEFENCE SPENDING AND THE 2%: LOOKING BEHIND THE HEADLINES. May 14. Accessed May 11, 2022. https://cdainstitute.ca/defence-spending-and-the-2-looking-behind-the-headlines/?msclkid=5cd90373d12f11ec9ecb3aa640c65b9a.)

[20] (Taylor, Brendan. 2020. "Taiwan flashpoint: What Australia can do to stop the coming Taiwan crisis." Lowy Institute. February. Accessed May 17, 2022. https://www.lowyinstitute.org/publications/taiwan-flashpoint-what-australia-can-do-stop-coming-taiwan-crisis#:~:text=Taiwan%20Flashpoint%3A%20What%20Australia%20Can%20Do%20to%20Stop,involvement%20in%20the%20flashpoint.%20Brendan%20Taylor%20Key%20Findings, 4)

arrangement between Australia, the UK, and the US. This could possibly unlock access to AUKUS technological advances in artificial intelligence, quantum computing and cyber technology,[21] and ultimately provide international credibility to reinforce Canada's place as a medium power on the international stage.

Options for a Canadian AEWC platform are limited. There are only a handful of military off the shelf (MOTS) designs available that range from the SAAB GlobalEye to the Boeing E7 Wedgetail, which has been selected by the Royal Australian Air Force, the RAF and most recently the US Air Force as successor AEWC platforms. The alternative to a MOTS procurement would necessitate a complex, lengthy and costly developmental design based on bespoke Canadian requirements. A MOTS procurement is vital to ensure a successful and timely delivery of a AEWC capability to the RCAF. The Canadian military procurement system has proven incapable of delivering a developmental program quickly or on budget, as it does not possess the required expertise, flexibility, or accountability within the current procurement organisations.[22] Growth potential for the main systems is also an important consideration, as is interoperability with allied nations. As such, the benefit of a Canadian AEWC capability using the same platform, sensor and mission systems as our NORAD and closest NATO partners is significant, for both overall cost reduction and operational interoperability.[23]

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[21] (Tarapore, Arzan. 2021. AUKUS Is Deeper Than Just Submarines. September 29. Accessed May 11, 2022. https://fsi.stanford.edu/news/aukus-deeper-just-submarines.)

[22] (Saideman, Stephen. 2018. Forget more defence dollars — Canada needs to fix its procurement process. February 23. Accessed May 11, 2022. https://opencanada.org/forget-more-defence-dollars-canada-needs-fix-its-procurement-process/?msclkid=022eb7bad14311ec9525a177b67c0663.)

[23] (Ripley, Tim. 2021. "Wedgetail club: UK AEW&C capabilities." Janes Defence Weekly. July 20. Accessed April 2022. https://defense.info/defense-decisions/2020/04/the-uk-adds-wedgetail-the-future-of-wedgetail-as-an-allied-capability/.)

As important as interoperability with allies is, it is vital that a future AEWC design be interoperable with future RCAF and CAF weapons systems. The architecture of the mission systems, secure communications and sensors must be capable of interacting and fusing with the systems of the future fighter design in particular, if its low detectability, electronic warfare and advanced capabilities are to be exploited fully by the RCAF. The ability to work hand-in-glove with current and a future maritime patrol aircraft must be considered also; the sensor packages on both platforms contribute significantly to an overall theatre intelligence, surveillance, target acquisition and reconnaissance (ISTAR) picture, which is a vital addition to pan-domain awareness. Consideration to align the AEWC and maritime patrol projects with common air vehicles would provide efficiencies in life-cycle costs and training through common parts procurement and cross platform training, which could be further exploited through partnership arrangements with allies operating the same types. Ground based radar and space-based sensor inputs for future NORAD enhancement will most likely revolutionize the current air defence system, and to be relevant, interoperability with NORAD forces is vital if the RCAF and Canada are to be considered reliable partners in continental defence.

A Canadian AEWC capability will be an important part of meeting Canadian defence policy commitments of contributing to continental defence, signaling commitment to NATO and key allies, while also being an instrument of government foreign policy. The flexible nature of AEWC, inherent in airpower, will allow the CAF to continue to punch above the current and future governments' weight, support Canada's two percent NATO narrative and simultaneously reinforce arctic sovereignty aims.

Conclusion

Surveillance from the air has proven to be vital in the employment of airpower throughout history; knowing where an opponent is enables decisive offensive action, but importantly, the lack of this capability endangers friendly forces as experienced by the RN in the Falklands conflict. AEWC has become an integral part of joint operations that provides an important addition to the pan-domain C^2 structure. It provides commanders with a flexible asset with which to control offensive, defensive or air policing activities to support Land, Maritime, or Special forces, while simultaneously coordinating air battle management activities for friendly forces.

Against the backdrop of increasing global tension between the US, Russia and China, Canada will be required to maintain its foreign policy aims and "step up" to continue to support NATO and the commitments to UN operations in the Pacific region. Modern threats require a state-of-the art system to monitor, and if necessary, respond to adversaries; Canada's shared commitments to continental defence through NORAD, and collective security through NATO will require a more flexible and capable surveillance and C^2 architecture to maintain relevance militarily and politically. An AEWC capability is deemed the most effective way of enhancing NORAD's future surveillance systems, while also enabling Canada to commit in-demand assets to meet international obligations, signal Canadian foreign policy priorities and raise national prestige within the rules based international governance system.

In order to capitalize on this potential, the RCAF will need to be provided with an AEWC platform and systems that is common with allies and partner nations, and that is

fully interoperable with current and future CAF platforms. The procurement must be a MOTs design as Canada's recent record of developmental weapons systems is poor. The Boeing E7 Wedgetail has been selected by all of Canada's allies as an AEWC solution to provide pan-domain ISTAR capability to meet emerging threats. By being part of the Wedgetail club, Canada will meet its own defence policy objectives, while maintaining political and foreign policy commitments and convening joint and multinational forces to uphold the global governance system.

BIBLIOGRAPHY

Aksu, Maj Osman. 2021. "Delivering NATO Air & Space Power at the Speed of Relevance." *Joint Air Power Competance Centre.* September. Accessed April 2022. https://www.japcc.org/?s=Delivering+NATO+Air+%26+Space+Power+at+the+Speed+of+Relevance.

Bronk, Justin. 2014. "NATO Baltic Air Policing – Revenge of the Cold WarRelic." *The Royal United Services Institute.* June 4. Accessed April 2022. https://www.rusi.org/publication/nato-baltic-air-policing-revenge-cold-war-relic.

Canada. Department of National Defence. 2017. "Strong, secure, engaged : Canada's defence policy." *Government of Canada.* Accessed November 24, 2021. https://publications.gc.ca/site/eng/9.835971/publication.html.

Canada. Privy Council Office. 2004. *Securing an Open Society : Canada's National Security Policy.* Ottawa: Privy Council Office.

CHAPMAN, KHALEM. 2018. "Airborne Early Warning and Control: Detecting the Battlespace." *Royal Aeronautical Society.* September 18. Accessed April 2022. https://www.aerosociety.com/news/airborne-early-warning-and-control-detecting-the-battlespace/.

Dorschner, James. 2020. "High North: NATO and Russia expand into the Arctic." *Janes.* February 13. Accessed April 2022. https://customer-janes-com.cfc.idm.oclc.org/janes/search?q=High%20North%3A%20NATO%20and%20Russia%20expand%20into%20the%20Arctic&pg=1.

Gibson, Chris. 2020. "Book Review - THE ADMIRALTY AND AEW: ROYAL NAVY AIRBORNE EARLY WARNING PROJECTS." *RCAF Journal - SPRING 2020 - Volume 9, Issue 2*, Spring : 61-62.

Global Affairs Canada. 2017. "Address by Minister Freeland on Canada's foreign policy priorities." *Global Affairs Canada.* June 6. Accessed October 13, 2021. https://www.canada.ca/en/global-affairs/news/2017/06/address_by_minister_freeland.

Light, Robert. 2015. *Canada's mission against ISIS.* December 7. Accessed May 11, 2022. https://canpol.wordpress.com/2015/12/07/canadas-mission-against-isis/?msclkid=5b396f82d12b11ec8c7fae48151f221d.

Overton, Matthew. 2017. *DEFENCE SPENDING AND THE 2%: LOOKING BEHIND THE HEADLINES.* May 14. Accessed May 11, 2022. https://cdainstitute.ca/defence-

spending-and-the-2-looking-behind-the-headlines/?msclkid=5cd90373d12f11ec9ecb3aa640c65b9a.

Ripley, Tim. 2021. "Wedgetail club: UK AEW&C capabilities." *Janes Defence Weekly.* July 20. Accessed April 2022. https://defense.info/defense-decisions/2020/04/the-uk-adds-wedgetail-the-future-of-wedgetail-as-an-allied-capability/.

Royal Canadian Air Force. 2016. *Royal Canadian Air Force Doctrine.* Ottawa: Ministry of National Defence.

Saideman, Stephen. 2018. *Forget more defence dollars — Canada needs to fix its procurement process.* February 23. Accessed May 11, 2022. https://opencanada.org/forget-more-defence-dollars-canada-needs-fix-its-procurement-process/?msclkid=022eb7bad14311ec9525a177b67c0663.

Shields, John. 2021. *Air Power in the Falkands Conflict.* Barnsley: Pen & Sword Books Ltd.

Tarapore, Arzan. 2021. *AUKUS Is Deeper Than Just Submarines.* September 29. Accessed May 11, 2022. https://fsi.stanford.edu/news/aukus-deeper-just-submarines.

Taylor, Brendan. 2020. "Taiwan flashpoint: What Australia can do to stop the coming Taiwan crisis." *Lowy Institute.* February. Accessed May 17, 2022. https://www.lowyinstitute.org/publications/taiwan-flashpoint-what-australia-can-do-stop-coming-taiwan-crisis#:~:text=Taiwan%20Flashpoint%3A%20What%20Australia%20Can%20Do%20to%20Stop,involvement%20in%20the%20flashpoint.%20Brendan%20Taylor%20Key%20Findings.