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## **An Airborne Early Warning and Control Capability for the RCAF**

**Major Pierre-Luc Lafontaine**

**JCSP 48**

**Service Paper**

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# **AN AIRBORNE EARLY WARNING AND CONTROL CAPABILITY FOR THE RCAF**

## **AIM**

1. This paper aims to inform leadership and enable a discussion regarding the acquisition of an Airborne Early Warning and Control (AEW&C) capability for the Royal Canadian Air Force (RCAF).

## **INTRODUCTION**

2. The global defence and security environment is complex and rapidly evolving. Canada and its Allies face a wide range of threats, from the persistent threat of non-state actors to the re-emergence of great power competition. Compounding the problem is the rapid evolution of technology and advances in key military capabilities such as hypersonic missiles and unmanned systems that challenge our collective ability to defend against threats at home, in North America, and globally. The speed and global reach of new weapon systems require a broader set of capabilities, fully integrated across domains. The Canadian Armed Forces (CAF) “must strengthen North American defences while remaining globally coherent”, information dominance and decision superiority will be key in future conflicts.<sup>1</sup> To that end, this paper proposes that the RCAF acquire an AEW&C capability as a linchpin of its future system-of-systems (SoS) force design.

3. The discussion section of this paper has three main parts. Part one situates the proposal within the strategic context and describes key roles and missions of the proposed capability. Part two presents potential aircraft solutions and discusses important aspects of the proposal such as fleet size, basing locations, anticipated cost and schedule. Lastly, part three provides a preliminary PRICIE<sup>2</sup> analysis and considerations for the AEW&C proposal.

## **DISCUSSION**

### **Part 1 – The Strategic Context**

4. The proposal is for a Canadian AEW&C capability that would be capable of conducting a variety of roles and missions, domestically and internationally. An AEW&C capability that could support North American Aerospace Defense Command (NORAD) or contribute internationally as part of multi-national coalition operations. A capability that could fulfill multiple roles such as Early Warning of air threats, Airborne Command

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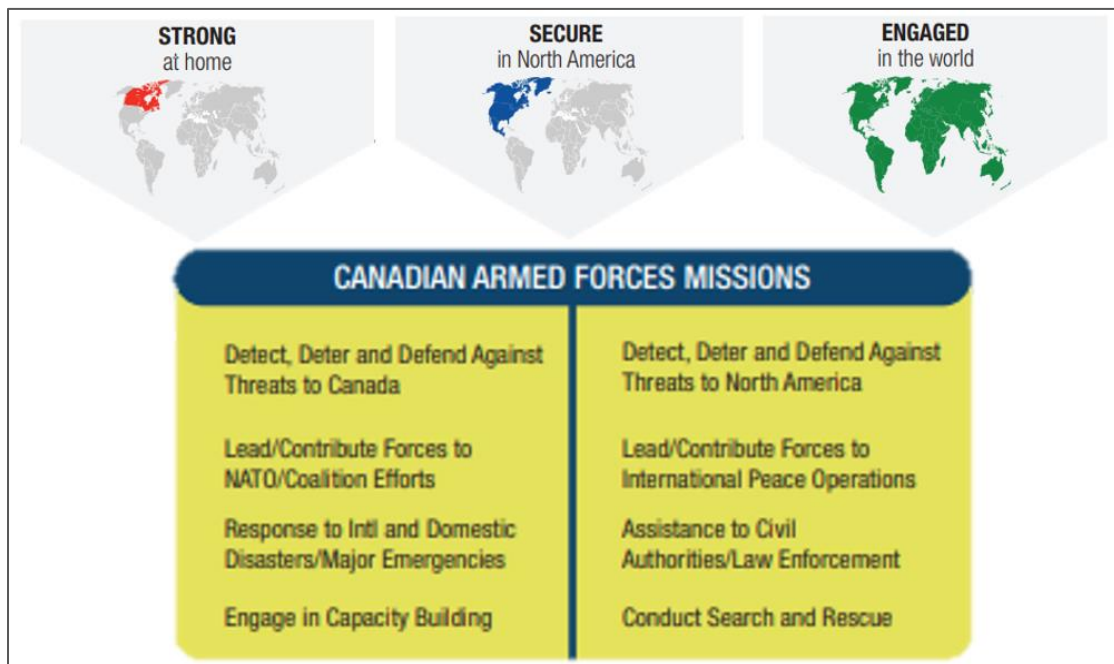
<sup>1</sup> Department of National Defence, Pan-Domain Force Employment Concept: Prevailing in an Uncertain World (draft), (Ottawa: DND Canada 2020), 3.

<sup>2</sup> PRICIE refers to : P – personnel, leadership, individual training; R – research and development, operational research; I – infrastructure and environment; C – concepts, doctrine, collective training; I – information management and information technology, E – equipment, support and sustainability. (as defined in the Project Approval Directive)

and Control, and Battle space management; a force multiplier for other assets by enabling the exchange of information and contributing to the shared multi-domain awareness. A capability that would be highly interoperable with other CAF elements in Canada but also with North Atlantic Treaty Organization (NATO) Allies and NORAD. Lastly, a capability with the reach and endurance to monitor Canada’s vast territory and territorial approaches and capable of operating globally, independently, or with allies.

5. A Canadian AEW&C would contribute to all eight missions mandated in Strong, Secured, and Engaged (SSE),<sup>3</sup> as shown in Figure 1. For example, it would contribute to:

- *Strong at home* by providing support during national emergencies and natural disasters and support search and rescue operations.
- *Secured in North America* by detecting maritime surface or air threats to Canada and North America and enabling a timely response as part of NORAD.
- *Engaged in the world* by providing battlespace management and aerospace control on multinational coalition operations.



**Figure 1: Canadian Armed Forces Missions**

Source: Modified from SSE, 60-61, 81.

5. Additionally, the capability would contribute to fulfilling Canada’s defence policy. While SSE does not specifically budget for a new AEW&C capability for the RCAF, it directly supports initiative #111 to “modernize NORAD” and indirectly supports a number of other SSE initiatives, shown in Figure 2.<sup>4</sup>

<sup>3</sup> Department of National Defense. *Strong, Secure, Engaged*, (Ottawa: Minister of National Defense, 2017), 81.

<sup>4</sup> Ibid, 104-113.

## Canadian AEW&C Proposal - SSE Linkages

- **Initiative #111** – “Modernize NORAD to meet existing challenges and evolving threats to North America, taking into account the full range of threats”
- **Initiative #57** – “Acquire airborne ISR platforms”
- **Initiative #62** – “Acquire joint command and control systems and equipment, specifically for integrated information technology and communications”
- **Initiative #63** – “Acquire joint signals intelligence capabilities that improve the military’s ability to collect and exploit electronic signals intelligence on expeditionary operations”
- **Initiative #67** – “Invest in Joint Intelligence, Surveillance and Reconnaissance platforms, including next generation surveillance aircraft . . .”

Legend: ▪ **Direct Policy Linkage** ▪ **Indirect Policy Linkage**

**Figure 2: Canadian AEW&C Proposal Linkages to SSE**

Source: Author’s selection of SSE initiatives, 104-113.

7. Several geostrategic factors support the acquisition of a Canadian AEW&C capability. This paper highlights two important factors driving the AEW&C requirement: the increasing geostrategic importance of the Arctic and the need to modernize NORAD:

- *The Arctic*: The geostrategic significance of the Arctic is on the rise. Access to sea routes in the Arctic is of strategic importance but channels and straits in Canada’s Arctic are not universally recognized, most notably the Northwest Passage.<sup>5</sup> Meanwhile, Russia continues to develop capabilities to defend its interests in the region.<sup>6</sup> Similarly, China has its own Arctic ambitions and recently declared itself a near-Arctic state.<sup>7</sup> It is imperative for Canada to exercise its own sovereignty in the Arctic and for the RCAF to have the means to project power in the region.
- *NORAD “Strategic Modernization.”*<sup>8</sup> The revisionist foreign policy of China and Russia along with the development of new weapon systems such as hypersonic missiles pose a significant challenge to NORAD.<sup>9</sup> The

<sup>5</sup> The Canadian Encyclopedia, “Canadian Arctic Sovereignty,” accessed 22 December 2021, <https://www.thecanadianencyclopedia.ca/en/article/arctic-sovereignty>

<sup>6</sup> CNN, “Satellite images show huge Russian military buildup in the Arctic,” accessed 22 December 2021, <https://www.cnn.com/2021/04/05/europe/russia-arctic-nato-military-intl-cmd/index.html>

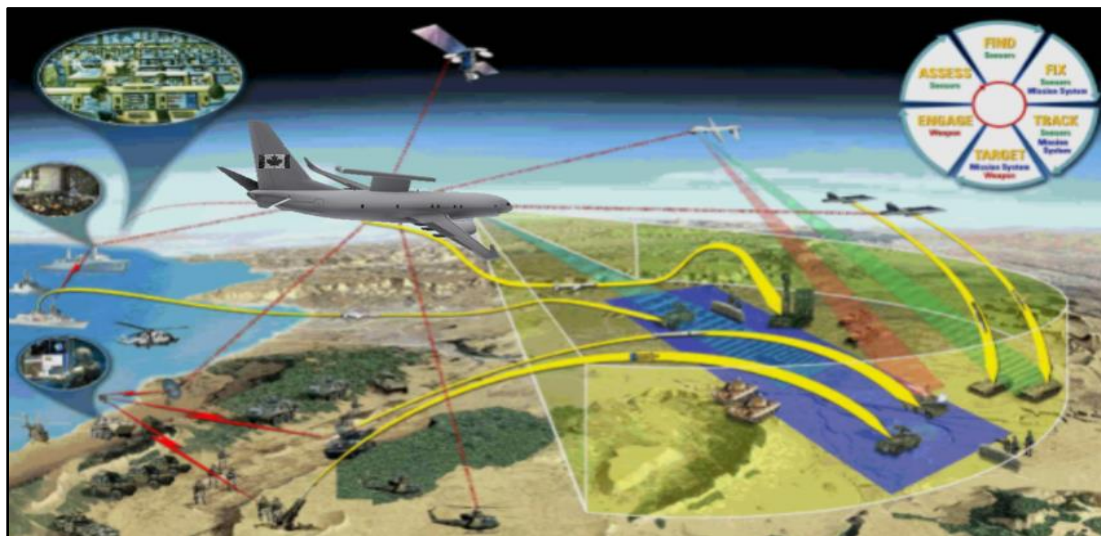
<sup>7</sup> DefenceNews, “China’s strategic interest in the Arctic goes beyond economics,” accessed 22 December 2021, <https://www.defensenews.com/opinion/commentary/2020/05/11/chinas-strategic-interest-in-the-arctic-goes-beyond-economics/>

<sup>8</sup> NORAD and USNORTHCOM Strategy Executive Summary, “To Compete Globally, We Must Be Strong At Home,” March 2021, [https://www.northcom.mil/Portals/28/\(U\)%20NORAD-USNORTHCOM%20Strategy%20EXSUM%20-%20Signed.pdf](https://www.northcom.mil/Portals/28/(U)%20NORAD-USNORTHCOM%20Strategy%20EXSUM%20-%20Signed.pdf)

<sup>9</sup> Canadian Global Affairs Institute, “NORAD: Remaining Relevant,” accessed 22 December 2021, [https://www.cgai.ca/norad\\_remaining\\_relevant](https://www.cgai.ca/norad_remaining_relevant)

NORAD Modernization is in its infancy, with ongoing bilateral discussions on capabilities and burden sharing.<sup>10</sup> One thing is clear, however, Canada must carry its fair share of the defence burden to remain a relevant partner. The US operates E3-Sentries to support NORAD, but the fleet is approaching its end-of-useful-life.<sup>11</sup> A Canadian AEW&C capability could be procured in anticipation of the E3-Sentry retirement. The Canadian AEW&C capability would make meaningful contributions to the three NORAD missions: Aerospace Warning, Aerospace Control and Maritime Warning.<sup>12</sup> In short, a Canadian AEW&C capability would enhance the effectiveness of NORAD, free US capacity, and would provide strong political benefit for Canada by demonstrating to the US that Canada remains a credible and valuable defence and security partner.

8. *Mission vignette #1:* When employed in the battlespace management role in support of expeditionary operations, Figure 3, the Canadian AEW&C aircraft C4ISR<sup>13</sup> capabilities would provide timely information to land, air, maritime forces assets and command centers. For example, the Canadian AEW&C aircraft could coordinate and control Close Air Support (CAS) air assets to support of friendly troops in contact.



**Figure 3: Canadian AEW&C aircraft in expeditionary operations**

Source: Author modified from BSI (bsipk.net).

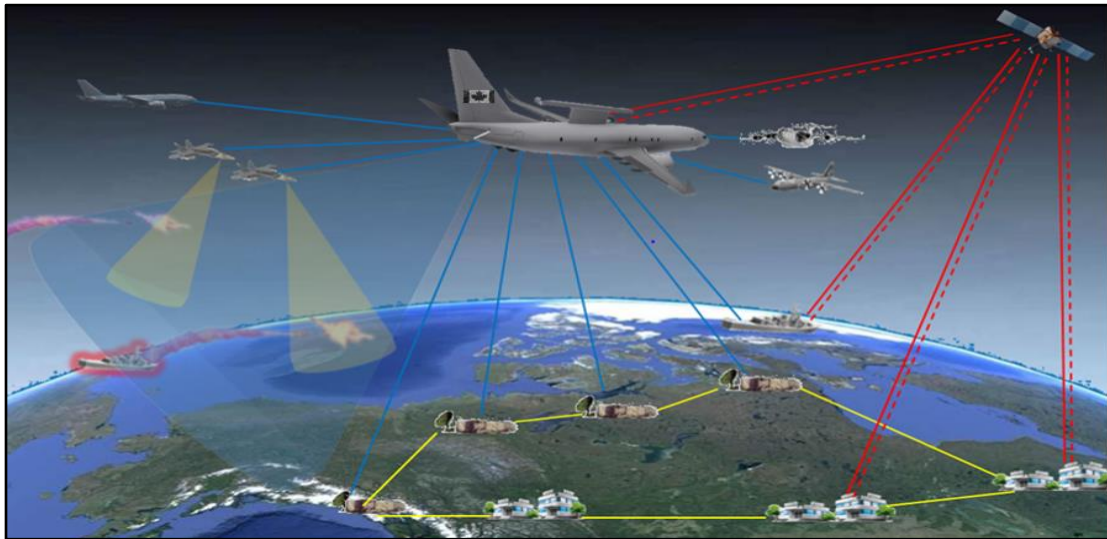
<sup>10</sup> Conference of Defence Associations institute, *NORAD Modernization Forum: Information Dominance*, October 2021, 2-3. <https://cdainstitute.ca/wp-content/uploads/2021/10/2021-10-NORAD-Modernization-Information-Dominance.pdf>

<sup>11</sup> Janes, “USAF Launches E-3 Replacement Effort, Notes E-7 Intent,” accessed 22 December 2021, <https://www.janes.com/defence-news/news-detail/usaf-launches-e-3-replacement-effort-notes-e-7-intent>

<sup>12</sup> NORAD, “NORAD agreement,” accessed 22 December 2021. <https://www.norad.mil/About-NORAD/NORAD-Agreement/>

<sup>13</sup> Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) is a broad term that refers to the systems, procedures and techniques used to collect and disseminate information for the purpose enhancing situational awareness and decision making.

9. *Mission vignette #2: AEW&C in support of NORAD*, Figure 4. When employed in an AEW&C role in support of NORAD, the Canadian AEW&C aircraft would provide early warning of threats to North America with a variety of sensors such as Active Electronically Scanned Array (AESA) radar and Electronic System Measures (ESM). The threat information would flow to the command-and-control network for decision-makers to employ appropriate defeat mechanisms. As part of a layered system-of-systems, the Canadian AEW&C aircraft would complement other assets such as ground-based, space-based and other air assets by providing unique capabilities, redundancy, and flexibility.



**Figure 4: Canadian AEW&C Aircraft in Continental Defence Role.**

Source: Author modified from the Canadian Multi-Mission Aircraft Strategic Context Document.

10. The AEW&C capability would complement the future RCAF C4ISR system-of-systems. The RCAF plans to procure two primary C4ISR platforms, the Canadian Multi-Mission Aircraft (CMMA)<sup>14</sup> specialized in the maritime domain to replace the aging CP140 Aurora and a new Remotely Piloted Aircraft System (RPAS)<sup>15</sup> specialized in the land domain. The AEW&C proposal would fill the aerospace specialty niche with long-range aerospace sensing and control while providing redundancy and additional capacity in other domains, Figure 5. Together, this trio would give the RCAF a robust multi-domain C4ISR capability contributing to achieving information dominance.

<sup>14</sup> Defence Capability Blueprint, “Canadian Multi-Mission Aircraft,” accessed 22 December 2021, <http://dgpaapp.forces.gc.ca/en/defence-capabilities-blueprint/project-details.asp?id=975>

<sup>15</sup> Defence Capability Blueprint, “Remotely Piloted Aircraft System,” accessed 22 December 2021, <http://dgpaapp.forces.gc.ca/en/defence-capabilities-blueprint/project-details.asp?id=977>



**Figure 5: RCAF's future C4ISR capabilities.**

Source: The Author, with Information from Defence Capability Blueprint.



## Part Two – AEW&C solutions and considerations

11. Part one briefly situated the proposal within the strategic context, highlighting its potential roles, missions, and linkages to SSE. Part two covers potential AEW&C solutions for Canada while highlighting some considerations such as the estimated fleet size, basing options, expected acquisition cost, and project timeline.

12. There are several AEW&C aircraft in operations around the world. Providing an exhaustive list of potential candidates alongside technical specifications is outside the scope of this paper, however, two Military-Off-The-Shelf (MOTS) solutions are included here for discussion and awareness; the Boeing Wedgetail (Annex A) and the Saab GlobalEye (Annex B).

- The Wedgetail is operated by Australia, Turkey, South Korea, and the United Kingdom. The US Air Force (USAF) is currently studying this option to replace their fleet of E3-Sentinel.<sup>16</sup> It is a proven capability with relatively low project risks and proven interoperability with FEYES partners.<sup>17</sup> However, the direct economic benefits for Canada would be limited given the maturity of the MOTS solution and absence of Canadian content, the value proposition likely limited to the application of the Industrial and Technological Benefits (ITB) policy.<sup>18</sup>
- The Saab AEW&C GlobalEye recently entered service in 2020 and is operated by the United Arab Emirates. It is based on the Global 6000-6500 platform, which gives the GlobalEye a strong combination of speed, range, and endurance.<sup>19</sup> It is also a proven MOTS capability but none of Canada's close allies currently operates the platform. When compared with the Wedgetail, there is a better prospect for economic benefits and Canadian content given that the base platform is manufactured by Bombardier.

13. Two important considerations regarding the introduction of a new fleet in the RCAF include estimating the number of platforms to acquire and the optimal basing location for the new fleet.

- This paper assumes a fleet size of six aircraft to enable further discussion. This assumption is based on Australia's AEW&C fleet size given that Canada and Australia are relatively similar in terms of military budget, capability, population, and size of the territory. Many factors would need

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<sup>16</sup> Janes, "USAF Launches E-3 Replacement Effort, Notes E-7 Intent," accessed 22 December 2021, <https://www.janes.com/defence-news/news-detail/usaf-launches-e-3-replacement-effort-notes-e-7-intent>

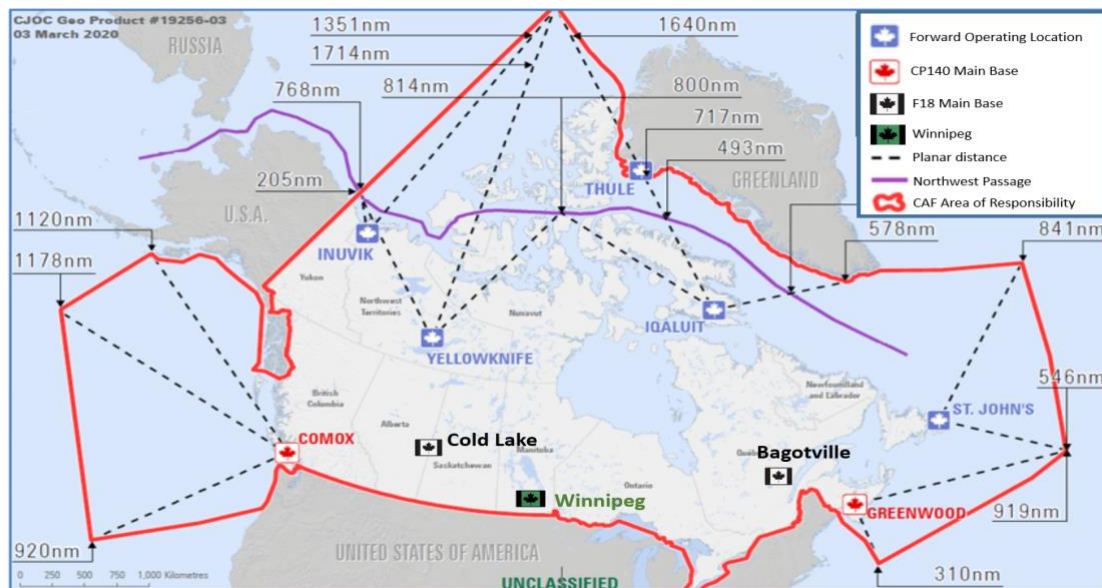
<sup>17</sup> Boeing, "Airborne Early Warning & Control," accessed 22 December 2021, <https://www.boeing.com/defense/airborne-early-warning-and-control/>

<sup>18</sup> Government of Canada, "Industrial and Technological benefits," accessed 22 December 2021, <https://www.ic.gc.ca/eic/site/086.nsf/eng/home>

<sup>19</sup> SAAB, "GlobalEye: Performance beyond limits," accessed 22 December 2021, <https://www.saab.com/contentassets/63a8d60ee513403c9ca149c3ae20053e/globaleye>

to be considered to determine the optimal fleet size for Canada such as aircraft speed, range, and endurance, acquisition and sustainment cost, human resources and other constraints. Supposing a fleet serviceability rate of ~70%, a fleet size of six aircraft should translate into four aircraft available and mission-ready at any given time.

- This paper considers two basing options. The first option is to divide the fleet between Cold Lake and Bagotville, collocating the fleet with the fighter force, Figure 6. Operational missions under NORAD could be performed from the main operating bases given the long-range and endurance of AEW&C aircraft. Forward Operating Locations, such as Inuvik, would be available as required for missions in the far north. However, dividing the fleet into two locations would lead to a duplication of a portion of support personnel, equipment, and infrastructure. Alternatively, the fleet could be centrally located in one location such as Cold Lake to avoid such duplications; however, responsiveness would be lesser in parts of the AOR. The final determination would require a detailed analysis of all factors at play and consider other basing arrangements such as the Greenwood and Comox pairing.



**Figure 6: CAF Area of Responsibility and basing options**

Source: Author modified CJOC Geo Product.

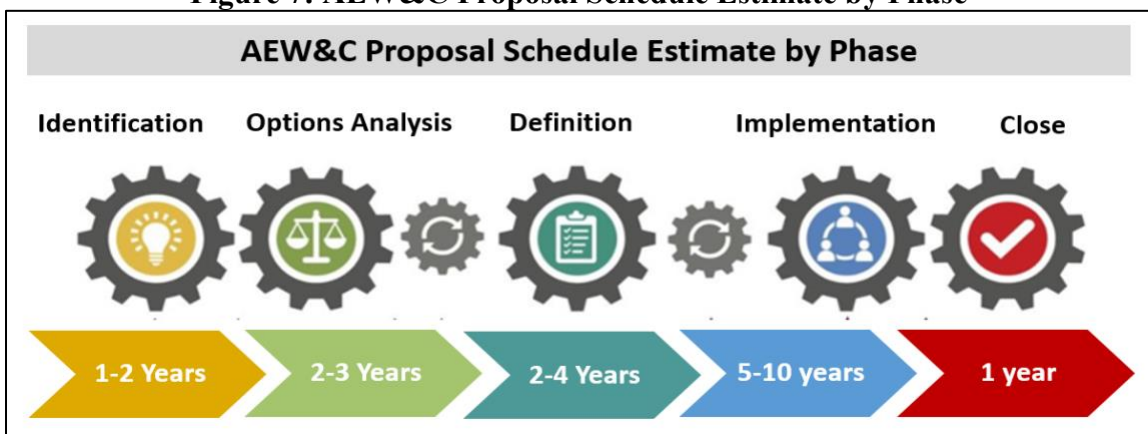
14. This paper draws on open-source information to gain a sense of the very rough order of magnitude (VROM) acquisition cost. Recent contracts for the E-7 Wedgetail<sup>20</sup>

<sup>20</sup> Airplane Update, “Boeing 737 AEW&C Eedgetail Specs, Radar, Engines, and Price,” accessed 22 December 2021, <https://www.airplaneupdate.com/2019/02/boeing-737-aewc.html>

and the Saab GlobalEye<sup>21</sup> indicate that the cost of a fleet of six AEW&C aircraft would range from \$2.5B to \$4.5B Canadian dollar if procured today. This VROM estimate is for acquisition only and in 2020-dollar value; it includes the aircraft, infrastructure, simulators, and initial support but does not account for inflation and sustainment costs over an expected 40 years of service life.

15. The AEW&C proposal would fall within the major project category and would follow the full project approval process as described in the 2019 Project Approval Directive (PAD).<sup>22</sup> The project duration is expected to be approximately 15 years (~10 to 20 years) from identification to project close-out. Figure 7 highlights the estimated duration of each project phases.

**Figure 7: AEW&C Proposal Schedule Estimate by Phase**



Source: Author’s assessment, Figure Modified from Project Approval Directive (PAD).

### Part 3 – Preliminary PRICIE Analysis

16. A detailed PRICIE analysis will be required as part of the project approval process and is normally done during the Options Analysis phase of a project.<sup>23</sup> This part covers some high-level elements of a preliminary PRICIE analysis for discussion purposes.

17. **P – Personnel:** The CAF is currently short of several thousand members and a new AEW&C capability would put additional pressure on CAF personnel.<sup>24</sup> Divestment of legacy capabilities, internal reallocation, and recruitment of personnel may be required to support a new AEW&C capability. An AEW&C mission crew range from six to 10

<sup>21</sup> DefenceNews, “Saab Nabs \$1 Billion Deal for Two More GlobalEye Planes to the United Arab Emirates,” accessed 22 December 2021, <https://www.defensenews.com/global/europe/2021/01/04/saab-nabs-1-billion-deal-for-two-more-global-eye-planes-to-the-united-arab-emirates/>

<sup>22</sup> Department of National Defence, *Project Approval Directive* (Ottawa: DND Canada, 2019), 305.

<sup>23</sup> Ibid, 367.

<sup>24</sup> CTVNEWS, “Canadian military short thousands of troops as COVID-19 impedes training efforts,” accessed 22 December 2021, <https://www.ctvnews.ca/politics/canadian-military-short-thousands-of-troops-as-covid-19-impedes-training-efforts-1.5308731>

people and two pilots.<sup>25</sup> A fleet of six aircraft would require approximately eight to 10 full crews. In addition, the number of maintainers and support personnel required are likely similar to the CP140 Fleet as a benchmark for comparison. Occupations required to operate the capability are already present in the CAF, such as Pilots, Air Combat Systems Officers, maintainers, and support trades.<sup>26</sup>

18. **R – Research and Development:** Research and development (R&D) support would be required throughout the project life cycle. An AEW&C project would benefit from early engagement with National Research Council (NRC) Canada and Defence Research and Development Canada (DRDC) to support the development and testing of new capabilities such as mission systems and sensors. Moreover, an AEW&C project would benefit from leveraging R&D programs such as the Innovation for Defence Excellence and Security (IDEaS).

19. **I – Infrastructure:** The construction of new infrastructure will be required to support the AEW&C fleet chosen main operating base(s). The infrastructure requirement would include typical hangars as well as training, maintenance, and support facilities. The infrastructure portion of the project is to be developed in close collaboration with Assistant Deputy Minister Infrastructure & Environment (ADM(IE)).

20. **C – Concepts and Doctrine:** Concepts of Operation (CONOPS) and Doctrine would need to be developed for the new AEW&C capability. While a new capability for Canada, many allies operate AEW&C aircraft, and their expertise and doctrines could be leveraged. The responsibility to develop CONOPS and doctrine would be shared by the AEW&C project and the RCAF Air Warfare Center (RAWC).

21. **I – Information Management and Information Technology:** The effectiveness of a new AEW&C capability would be highly dependent on a secure and reliable C4ISR network. To that end, the detailed AEW&C requirements should be developed in close collaboration with DND's Information Technology (IT) and Information Management (IM) Groups.

22. **E – Equipment, Support, and Sustainability:** The AEW&C fleet would require a variety of equipment to support and sustain the capability. For example, the equipment required would include platform-specific maintenance tools, maintenance trainers and mission-support systems. The development of Sustainment Business Case Analysis (SBCA) will be required as part of the project approval process to define the sustainment requirements and select the preferred sustainment solution.<sup>27</sup> The SBCA process will determine the level of maintenance under the responsibility of military personnel (e.g. first and second line) and maintenance contracted to civilian partners (e.g. third line).

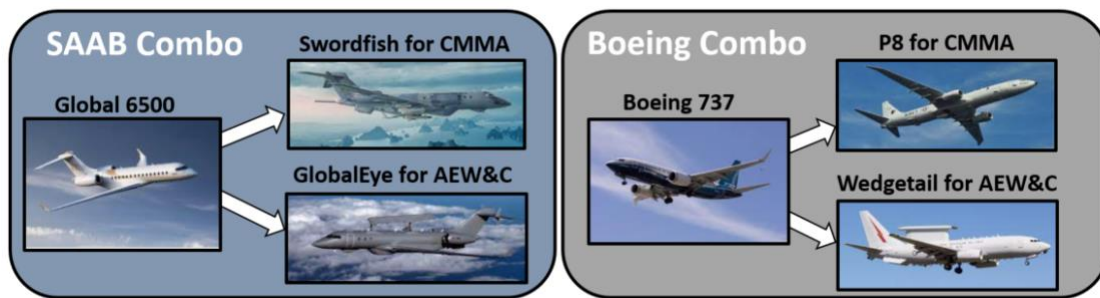
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<sup>25</sup> Boeing, "Airborne Early Warning & Control," accessed 22 December 2021, <https://www.boeing.com/defense/airborne-early-warning-and-control/>

<sup>26</sup> Government of Canada, "Canadian Forces Recruitment Website," accessed 22 December 2021, <https://forces.ca/en/>

<sup>27</sup> Government of Canada, "Evaluation of Sustainment Initiative," accessed 22 December 2021, <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/evaluation-sustainment-initiative.html>

23. If RCAF constraints (e.g. financial) and capacity (e.g. people) are such that it is impracticable to field an AEW&C fleet of six aircraft as proposed, potential synergies and trade-offs could be explored. First, maintenance, support, and sustainment synergies could be realized by procuring both CMMA and AEW&C fleets based on the same airframe, examples shown in Figure 8. Alternatively, trade-offs could be explored with CMMA in terms of fleet size; the CMMA fleet size could be slightly reduced to free RCAF capacity for the acquisition of an AEW&C fleet of six aircraft. Lastly, the AEW&C fleet could be reduced to four aircraft and based in a single central location (e.g. Cold Lake). While this would reduce operational capacity and responsiveness to some extent, a fleet of four aircraft should still ensure that two to three AEW&C aircraft are available and mission-ready at any given time. Any combination of these suggestions would significantly lessen the burden associated with fielding a new AEW&C capability.



**Figure 8: Common platform example for CMMA & AEW&C**  
Source: The author using images from various sources

## CONCLUSION

24. The global defence and security environment is complex and rapidly evolving. North America is no longer a sanctuary and Canada must do more under NORAD while enhancing its ability to contribute to collective deterrence globally. To that end, this paper argues that the RCAF should procure an AEW&C capability to fulfill its mandate at home and elsewhere in the world. The AEW&C capability would be a critical enabler to operations and a main contributor toward information dominance. The capability would fulfil a variety of roles and missions such as Airborne Early Warning and Control, Battlespace Management, and multi-domain C4ISR.

25. This paper briefly situated the proposed investment within the strategic context, highlighting strong policy linkages and geostrategic factors driving the requirement. It provided examples of suitable AEW&C solutions along with a discussion of important aspects of the proposal such as the fleet size, basing location, estimated costs, and project schedule. Lastly, this paper provided a brief overview of a preliminary PRICIE analysis. While the scope of this paper did not permit a detailed analysis of all aspects of the proposal, it aimed at highlighting key considerations and implications to support further discussions regarding the initiation of a project to procure an AEW&C capability.

## **RECOMMENDATION**

26. This service paper recommends:

- That the RCAF initiate a comprehensive study to validate the capability requirements and the high-level scope of a potential AEW&C project, including fleet size and basing location validation.
- That the CAF seeks policy approval for the acquisition of a new AEW&C capability.
- That the RCAF initiate a major capital acquisition project to procure an AEW&C capability.

### **Annexes:**

A. Boeing E-7 Wedgetail Overview

B. Saab GlobalEye Overview

## Boeing E-7 Wedgetail Overview

The 360-degree sensor coverage provided by the Northrop Grumman Multi-role Electronically Scanned Array (MESA) radar is fully compliant with international standards.

Detection and geolocation of emitters within the required frequency range allow surveillance, target identification, and threat warning.

Air-to-air refueling capability allows for extended on-station time, range, and mission support.

The multiservice, interoperable, FAA-certified communications system is capable of supporting multiple security classifications of voice and data transfer.

A single interface between multiple subsystems and the operator provides mission processing and display for the airborne mission segment.

Airborne Early Warning & Control	
<b>Airframe</b>	737-700 increased gross weight (IGW) airframe
<b>Radar</b>	Northrop Grumman "MESA" electronically scanned array radar system with 360 degrees/Air and Maritime modes/200 + nmi range/All Weather
<b>IFF</b>	300 nmi
<b>System Architecture</b>	Open
<b>Consoles</b>	Open
<b>Operational ceiling</b>	41,000 ft
<b>Range</b>	3,500 nmi
<b>Flight Crew</b>	2
<b>Mission Crew</b>	6 to 10

Source: Boeing, Airborne Early Warning & Control.  
<https://www.boeing.com/defense/airborne-early-warning-and-control/>

## Saab GlobalEye Overview

Solutions overview



- Latest generation Command & control
- Operators seated sideways
- Ergonomic seats
- Low cabin noise level and pressure altitude
- 6-seat rest area

### Domain capabilities

**Air surveillance:**

- Powerful new Erieye ER (Extended Range) radar to expand the detection distance for small and future targets
- Detection and tracking range significantly increased
- Designed to work in severe clutter and jamming conditions
- Adaptive AESA radar – energy is focused on areas or targets of interest

**Maritime surveillance:**

- Detects sea targets out to the elevated horizon
- Detects small boats like jet-skis at long distances
- The unique combination of Erieye ER and maritime surveillance radar allows for detection of objects down to the size of a periscope
- AIS, EOS and ISAR for identifying objects

**Ground surveillance:**

- Detects moving objects through long-range wide area GMTI
- Radar images, weather-independent, with a dedicated radar

**Mission capability:**

- Ultra-long range business jet, ideally suited for special missions applications, >11 h endurance
- Excellent airfield performance, 6500 ft, allows the use of smaller airports
- Full self-protection suite
- Ideal working conditions for all crew members

**Source:** SAAB, GlobalEye: Performance Beyond Limits, accessed 22 December 2021.  
<https://www.saab.com/contentassets/63a8d60ee513403c9ca149c3ae20053e/globaleye>



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