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BRIDGING THE GAP – SMALL MANNED ISR PLATFORMS

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JCSP 40

Exercise *Solo Flight*

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SOLO FLIGHT ESSAY

BRIDGING THE GAP, SMALL MANNED ISR PLATFORMS

By Major Kurt A. Lalonde

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Introduction

The capability to protect Canada and exercise Canadian sovereignty has long been a desire of the Government of Canada (GoC). The Canada First Defence Strategy has distilled the 2004 and 2005 National Security policies into three core roles: defend Canada, defend North America, and contribute to international peace and security. It is in this context that Intelligence, Surveillance and Reconnaissance (ISR) has become a key capability. ISR is used as part of the Canadian Armed Forces (CAF) Sense doctrine to inform the commander and provide situational awareness so that he can make appropriate decisions. To accomplish this goal, ISR must be persistent, timely and accurate.

This paper attempts to define the Canadian ISR capability gap. It speaks to the sheer size of the Canadian Area of Responsibility (AOR). It then identifies the threats to Canada. More specifically, it outlines the need for ISR to counter the unlikely possibility of a direct or asymmetric attack from an opposing force. It then highlights the more likely threats to sovereignty such as illegal immigration, environmental pollution, overfishing and criminal activity. It also outlines the current ISR capabilities and addresses the concept of a System of Systems (SoS). Firstly, it focuses on the use of RADARSAT2 as a wide area sensor that can cue "pouncer" aircraft to a particular Target of Interest (TOI). It then concentrates on the limited amount of aircraft available for ISR use in the Canada's AOR and emphasizes the use of contracted services such as Provincial Aerospace Ltd (PAL). This section also talks to the overuse use of the CP-140 Aurora to accomplish simple ISR missions which results in the inefficient use of assets.

The third section presents the King Air 350 Extended Range (ER) as a viable option to fill the identified capability gap. It highlights which other countries have procured similar platforms. It then outlines the aircrafts performance capabilities and identifies the minimum equipment list required. Finally, the benefits of such a procurement are discussed.

POLICY AND DOCTRINE

Policy

Surveillance of the Canadian land mass, its internal waters, as well as the maritime approaches as part of the maintenance of our sovereignty has long been a priority for the government. Several policy documents outline the requirement.

In *Securing an Open Society,* Canada's national security policy published in 2004, the GoC introduced three core national interests: protecting Canada and Canadians at home and abroad, ensuring that Canada is not used as a base for threats to our allies, and contribute to international security. Furthermore, the policy identified the requirement for increased capabilities for intelligence collection, "Intelligence is the foundation of our ability to take effective measures to provide for the security of Canada and Canadians"[1]. A year later, a second policy document was published called *Canada's International Policy Statement - a role of pride and influence in the world.* This document also identified three roles: Protecting Canadians, defending North America, and contributing to international peace and security. The policy goes on to specifically state key surveillance initiatives: improve Canada's maritime, land, air and space surveillance

[1] Canada. Privy Council Office. *Securing an Open Society - Canada's National Security Policy*. Ottawa: Privy Council Office, 2004, 15.

capabilities, and increase the CAFs capacity to monitor and respond to events in the North[2].

Subordinate to the national security policy, the Canada First Defence Strategy provides direction and guidance to the CAF. The strategy further distills and outlines three roles for the CAF: defend Canada, defend North America, and contribute to international peace and security. As part of these roles it requires the CAF to have the capacity to conduct daily domestic and continental operations, including in the Arctic.[3] The document also highlights the need for a whole-of-government approach to meeting future requirements which is reflected by how closely the CAF works with Other Government Departments (OGDs) in performing domestic ISR.[4] The current stakeholders are the Department of Fisheries and Oceans (DFO), Transport Canada, the RCMP, Canadian Border Services Agency, and the Coast Guard.

Exercising Canada's sovereignty requires the CAF to be able to be aware of anything going on in or approaching our territory. This speaks directly to the RCAF doctrine and is inculcated in the sense function.

Translating Policy into Doctrine

To be capable of performing the three roles identified in the Canada First Defence Strategy, the RCAF has defined six doctrinal functions as shown in Figure 1. Note that in

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[2] Canada. Department of National Defence. "A Role of Pride and Influence in the World: Defence" *Canada's International Policy Statement* (2005). Archived document on-line, last accessed 1 May 2014, http://www.isn.ethz.ch/Digital-Library/Publications/Detail/?ots783=0c54e3b3-1e9c-be1e-2c24-a6a8c7060233&lng=en&id=15094

[3] Canada. Department of National Defence. *Canada First Defence Strategy*. Archived document on-line; last accessed 1 May 2014; http://www forces.gc.ca/en/about/canada-first-defence-strategy.page; Internet, 3

[4] *Ibid, 4*.

order to get to the current state within the command function, it requires input from the sense function. For the purposes of this paper, the collection of information embedded in the sense function will be used interchangeably with the term Intelligence, Surveillance, and Reconnaissance (ISR). It provides commanders with knowledge that can then be used to make decisions and give direction to their forces.[5] ISR is used to build situational awareness (SA) on any given real world scenario. The sense doctrine manual goes further to state," SA contributes to creating an understanding in the minds of the information users".[6] Persistent, accurate, and timely intelligence from ISR platforms aids in predicting possible enemy actions and identifying targets. It allows the commander to make decisions faster than his opponent and is the principle function used by the government of Canada when it exercises its sovereignty.

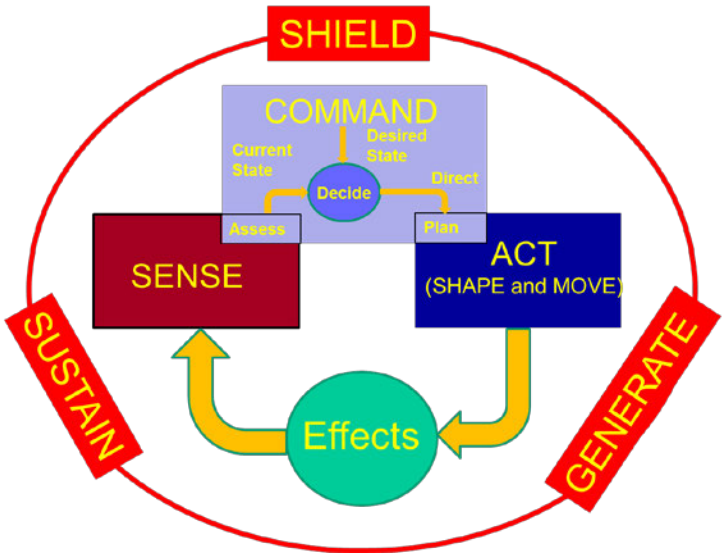

Figure 1 – The Royal Canadian Air Force functions[7]

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[5] Canada, Department of National Defence, B-GA-400-000/FP-000, Canadian Forces Aerospace Doctrine, (Ottawa: DND Canada, 2010), 37.
[6] Canada, Department of National Defenc,e B-GA-402-000/FP-001, Canadian Forces Aerospace SENSE Doctrine, (Ottawa, DND Canada, 2012), 8.
[7] *Ibid*, *35*.

IDENTIFYING THE GAP

Size Matters - Canadian AOR

When examining the current capabilities with respect to ISR collection platforms, it is the terms "persistent" and "timely" that are difficult to implement. When looking at the requirements for domestic ISR systems, the foremost concern is the size of the Canadian Area of Responsibility (AOR). The landmass and internal waters alone comprise a total area of 9,984,670 square kilometers.[8] Additionally, under the UN Convention on the Law of the Sea, Canada has responsibility for its Exclusive Economic Zone (EEZ) which extends out to 200 kilometers from shore[9]. Finally, Canada's maritime responsibility extends out even further to approximately eleven million square kilometers. Figure 2 depicts the sheer size of the area with the EEZ identified as the inner and middle bands and the AOR as the outer band. It is this enormity that makes it currently impossible to have persistent ISR coverage. The lack of wideband communication systems in the North also makes it difficult to transmit any collected information from the Arctic. This means an ISR platform has to travel back to base to download its recorded information which significantly increases the time for the sense function to feed a commander for a decision.

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[8] Central Intelligence Agency "The World Factbook", last accessed 1 May 2014, https://www.cia.gov/library/publications/the-world-factbook/geos/ca html,

[9] United Nations Convention on the Law of the Sea: A historical perspective. Last accessed 1 May 2014, http://www.un.org/Depts/los/convention_agreements/convention_historical_perspective htm#Key provisions.

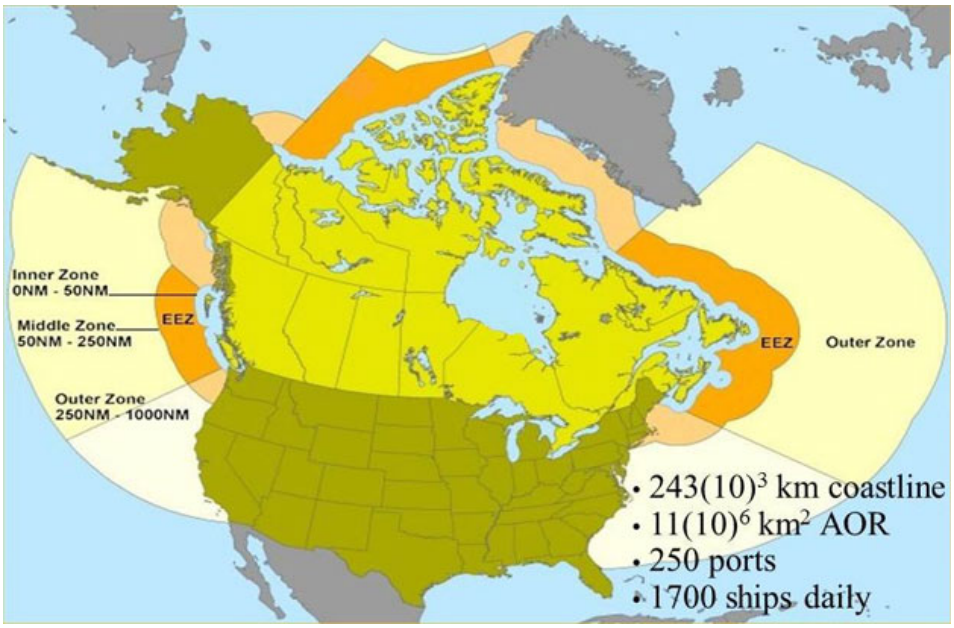

Figure 2- Depiction of Canada's EEZ and AOR[10]

Threats

There are several categories of threats that could manifest in the Canadian AOR.[11] The first would be military activity by forces hostile to Canada. The possibility of a military threat driven by political motivation within the Canadian AOR is probably minimal; however, threats to Canadian interests could arise from terrorism in support of some cause. With the advent of hybrid warfare, modern technology and the ready availability of military weapons are a reality.[12] In this respect, the use of air platforms in Canada's waters would most likely be in support of OGDs such as the RCMP.

Secondly, there are several ways an opposing force could challenge Canada's Sovereignty:

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[10]Marc Boucher, "The Defence and Security Applications of the RADARSAT Constellation Mission", last accessed 4 May 2014, http://spaceref.ca/space-quarterly/the-defence-and-security-applications-of-the-radarsat-constellation-mission.html

[11] Canada, Department of National Defence, "CP-140 Aurora Statement of Operational Requirement" 2001, 4

[12] Robert Wilkie, "Hybrid Warfare, Something Old Something New", *Air & Space Power Journal*, (Winter 2009), 1.

- Environmental Protection and Pollution.[13] Aircraft continue to be called upon to provide assistance within the Canadian AOR following an environmental disaster.
- Resource Protection.[14] There will be continuing pressure on the fishing stocks off the three coasts and aircraft are expected to retain an ISR capability in the EEZ in support of DFO;
- Criminal Activity.[15] The intensification of the illegal drug trade will continue. It is expected that co-operative ISR between OGDs and with other nations will become more extensive; and
- Illegal Immigration.[16] The potential for a projected increase in the number of attempted illegal entries into Canada by sea will remain a concern.

Thus, Canada's vast landmass and adjacent oceans pose a significant challenge in terms of exercising sovereignty in accordance with the Canada First Defence Policy. The identified threats illustrate the requirement for providing for the defence of Canada. This encompasses many types of ISR responsibility such as in aid to the Civil Power; providing surveillance and control; securing our borders against illegal activities; fisheries protection; environmental surveillance; disaster relief; and search and rescue.

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[13]David Suzuki, David Suzuki Foundation, "How Tankers and Drills threaten Canadian Waters", last accessed 8 may 2014, http://www.davidsuzuki.org/issues/oceans/science/marine-planning-and-conservation/how-tankers-and-drills-threaten-canadian-waters/

[14] Canada, Minister of Justice, "Oceans Act" (Ottawa, 2014), 7.

[15]Canada, RCMP website, "Serious and Organized Crime", last accessed 7 Jul 2014, http://www.rcmp-grc.gc.ca/soc-cgco/index-eng.htm

[16] Canada, "Detention and Removal of Individuals— Canada Border Services Agency" in *Report of the Auditor General of Canada to the House of Commons Chapter 7*", (Ottawa, 2008), 1.

This makes the combination of ISR systems or System of Systems (SoS) key to effectively addressing the CAFs sense function.[17]

System of Systems – Current Capability

RADARSAT 2

The SoS is a layered approach to ISR. At the very top, Canada now uses the RADARSAT 2 satellite via the Polar Epsilon Project. The CAF uses the synthetic aperture radar (SAR) imagery from the satellite to enhance the land and sea surveillance capabilities, giving the CAF an all-weather, day-night eye on the North.[18] It has a variety of modes that allow it a range of options from taking a wide-area look with a low resolution to concentrating on a smaller area with a much higher resolution.[19]

It does have some limitations though, there are gaps in the coverage as it is only one satellite and cannot be everywhere at once. This implies that a smart adversary could time his activities to these gaps as the timings and area coverage are easy to calculate. Despite these drawbacks, the speed and coverage of the satellite make it ideal for providing initial cueing to commanders who can then decide whether they need more persistent coverage of a Target of Interest (TOI). In most cases, due to the distances that need to be travelled, a dedicated airborne asset is required to provide this persistence.

There are a number of airborne platforms that could be cued by RADARSAT 2. These platforms in essence act as a "pouncer" aircraft and have a much narrower area to

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[17] Canada, Department of National Defence, "Recommendations on a Royal Canadian Air Force C4ISR Strategy and Campaign Plan 2012-2027", (Version 17.1- July 2012), 16.

[18] Canadian Space Agency Webpage, last accessed 4 May 2014, .http://www.asc-csa.gc.ca/eng/satellites/radarsat/radarsat-tableau.asp

[19] *Ibid*.

search. For the targets of interest in the Inner and Middle zones, smaller aircraft and helicopters are ideally suited. They have access to small gravel landing strips and could base and refuel at a number of coastal and Arctic communities. Typically, the type of ISR platform used depends on a number of tactical questions:

- how fast can it arrive onstation or how far is it to the TOI?;
- how long can the aircraft stay onstation?; and
- what is the weather like in the area?

Helicopters

Currently, there are two CAF helicopters that can contribute to the sense function: the venerable CH-124 Sea King and the CH-146 Griffon. The Sea King is used to extend a ship's surveillance capabilities but is essentially bound to remain close to the ship. Its sensors include surface search radar, and Automatic Identification System, and a hand held camera. There have been technology demonstrations that allow the CH-124 to transmit the handheld images and AIS data back to the ship while airborne which significantly increases the ship commanders SA by improving on the timeliness of the information.[20] The Griffon has proved an efficient ISR platform overland. It has an Electro Optic/ Infrared (EO/IR) camera with recording capability. Neither platform can get to a TOI quickly as their cruising speed is around 100 Knots. Their limited endurance also make them a secondary ISR platform of choice unless the TOI close by. Finally, helicopters are also more susceptible to the weather such as icing.

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[20] Major Kyle Roselund, former Commanding Officer of Helicopter Operational Test and Evaluation Flight (HOTEF), conversation with author, 5 May 2014.

Fixed Wing Aircraft

Fixed wing aircraft are preferred over helicopters as ISR platforms because of their performance characteristics. Fixed wing aircraft will get to the area of interest quicker, will be able to stay longer, and can typically endure the harsher weather conditions.

Historically, anything in the EEZ/Inner Zone was handled by the CP-121 Tracker aircraft in the 1980s. When the Tracker was retired in 1989, nothing replaced it due to budget cuts.[21] The GoC turned to contracting out a subset of its ISR requirements to Provincial Aerospace Ltd (PAL). The company continues to provide maritime ISR and is based on both coasts. The company's primary client is the DFO, but OGDs such as Transport Canada use the data and direct aircraft use for other maritime surveillance missions.[22] The King Air 200s aircraft are used for maritime surveillance and carry an X-band radar for surface contacts and a Forward Looking Infrared (FLIR) Infrared system. The CAF does not currently have its own indigenous small fixed wing ISR platform equivalent.

Although there has been a worldwide proliferation of Unmanned Air Systems (UAS), there still some major hurdles to overcome in order to allow them to fly in Canadian domestic airspace without significant airspace pre-planning. Additionally, the UASs do not perform well in weather and most are not equipped for icing. Furthermore, significant infrastructure would be required in order to operate them in the Arctic as they are reliant on some sort of direct repeater station or beyond line of sight satellite control

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[21] Martin Shadwick, "Aurora Reconnaissance", *Canadian Military Journal* (Winter 2007 -2008), 102.
[22] Blair Watson,, "Keeping an eye on Canada's Oceans", *Wings Magazine*, Last accessed 4 May 2014, http://www.wingsmagazine.com/content/view/4757/38/

feed to a ground station. This infrastructure is currently not available in the Arctic.[23] Nonetheless, they do have the benefit of long endurance which will significantly increase ISR persistence and will eventually be part of the ISR SoS.[24] The CAF does not currently have indigenous UASs although several attempts have been made at procurement under the auspices of the JUSTAS program[25]. The current program has been delayed several times but is expecting to be able to progress in the 2014-2017 timeframe.

As a result of not having dedicated small fixed wing aircraft beyond what is provided by PAL, the GoC has had to rely on the CP-140 Aurora to act as a patrol aircraft in the inner and middle zones (EEZ). The CP-140 is truly overqualified for these missions. To answer the three platform questions, the CP-140 cruises at 350 knots and can remain airborne for up to 17 hours depending on the mission profile. Thus it can get onstation fast and then loiter providing some limited persistence. The aircraft itself is all-weather and is the same Lockheed P-3 Orion platform used by the National Oceanic and Atmospheric Association to fly in Hurricanes to collect data. [26] The upgraded Block 3 version is equipped with an all-weather SAR that is capable of identifying and tracking TOIs day or night. It also has an EO/IR camera that can also identify and film TOIs from a standoff distance. Additionally, it uses a sophisticated electronic support measures (ESM) system that allows for counter detection and identification of TOI transmissions. All of the sensor systems have recorders that need to be brought back after the mission

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[23] Elizabeth Howell, Spaceref.ca Website, "The Polar Communications and Weather Mission Can't Come Soon Enough", last accessed 10 may 2014, http://spaceref.ca/missions-and-programs/canadian-space-agency/polar-communication-and-weather-mission/the-polar-communications-and-weather-mission-cant-come-soon-enough html

[24] Chris Thatcher, "JUSTAS, Seeking the right solution", Vanguard Magazine (Dec/Jan 2013), 1.

[25] *Ibid.*

[26] National Oceanic and Atmospheric Association, last accessed , 4 May 2014, http://www.aoc noaa.gov/aircraft_lockheed htm

for replay. A trial project has been performed successfully using Inmarsat to transmit the EO/IR feed in near real time to a commander's laptop.[27] This highlights the importance of increasing the timeliness of the intelligence gathered. Finally, it has the secure beyond line of sight communications required to voice report its findings while onstation. However, this is a very expensive approach to accomplishing this type of mission. Additionally, the new sensor capabilities mean higher priority taskings for the 14 aircraft that are destined for upgrade. This creates a capability gap as they may not be available to perform the more routine patrols.

The sheer distance to the outer zones makes the CP-140 Aurora ideal for mission in these areas. Again, using the SoS, the aircraft would be cued by RADARSAT-2 or some other form of intelligence. This would allow the Aurora to limit its search for the TOI and increase its time on target. Similarly, the Aurora also performs the bulk of the surveillance in the Arctic due to its speed and endurance. However, it requires a 5000 foot runway to operate. This limits the possibilities of where it can be based out of in the Arctic.

Aircrew Training

Aircrew training within the RCAF is currently experiencing some instability. One of the major issues is that the Pilots, Air Combat Systems Officers (ACSOs), and Airborne Electronic Sensor Operators (Aesops) have to wait a significant period of time between their graduation from basic training and their Operational Training Unit (OTU).

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[27] Ian Coutts, "Arctic Picture: RCAF test Beyond Line of sight transmission", *Vanguard Magazine, June-July 2013*, 21.

Most of the waits are in the order of twelve to eighteen months.[28] Flying is a perishable skill and the wait is proving detrimental to the students with some of them requiring significant remedial training in order to pass their OTUs. The cost of extra flying hours on a large multi-engine aircraft is expensive. Additionally, most of the multi-engine aircraft such as the CC-130 Hercules and the CP-140 Aurora are currently overburdened with respect to Force Employment (FE) tasks. The extra remedial training hours also directly affects each platform's ability to perform those FE tasks. Flying on a smaller aircraft could help alleviate the issue by keeping the aircrew's skill level current at a comparably cheaper price.

The Multi-Engine Utility Flight (MEUF) was created for this exact reason, albeit only for the retention of pilot skills. LGen Watt, Chief of the Air Staff from 2007 to 2009, stated "one goal of this flight is to help maintain a more proficient and experienced group of pilots within the Air Force,"[29]. The MEUF flies two King Air B200s. Another justification for the procurement was to use these aircraft as a domestic light utility transport aircraft. The twin-turboprop aircraft can carry up to six passengers or a load of approximately 570 kg (1,250 lbs.) a range of approximately 1,800 kms.[30] However, the aircraft only do point to point flights and cannot perform any sort of ISR. As such, these aircraft could not be used to help stabilize the ACSO and Aesop training problem.

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[28] Maj Curtis Wright, ACSO Career Manager, conversation with author, 8 May 2014.
[29] Jennifer Jackson - 8 Wing Trenton, Aviation.ca, last accessed 4 May 14, http://www.aviation.ca/200906127478/news/canada/military/7478-the-multi-engine-utility-flight-8-wings-newest-addition,
[30] *Ibid*.

Summary – The Gap

Although RADARSAT2 has greatly improved the ability for wide area surveillance and cueing to "pouncer" aircraft, the CAF does not own a small medium ranged ISR platform to patrol the inner and medium zones associated with the EEZ. Direct military threats range from possible hostile action from an opposing force, to some form of hybrid warfare act of violence by a non-state actor. Threats to Canada's sovereignty include Environmental Protection and Pollution, resource protection, criminal activity, and illegal immigration. Although PAL is contracted to carry out some of these tasks, it is still not persistent ISR, nor can they perform the security roles required under the auspices of Canadian Defence. This results in the overtasking of the CP140 Aurora on ISR missions of relative simplicity. Additionally, this platform could be deployed to smaller airfields in the Arctic to aid in bolstering presence in the North. Finally, there is currently a need for an intermediate operational platform for aircrew to help stabilize their training path as they progress as aviators in the RCAF.

VIABLE OPTION – MEDIUM SIZED FIXED WING ISR PLATFORM

The US has invested significantly into new and used King Air 350s under the auspices of MC-12W Project Liberty. Both the USAF and US Army have orders for more. A number of other countries have followed suit, from open source information, Great Britain and Iraq have acquired the capability.[31] Although these aircraft can be used on both domestic and out of area operations, it demonstrates the versatility of the

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[31] Air Force Technology.com, "MC-12W Liberty Intelligence, Surveillance and Reconnaissance (ISR) Aircraft, United States of America", last accessed 4 May 2014, http://www.airforce-technology.com/projects/mc-liberty/

platform as an ISR asset. The King Air 350 ER would make an excellent platform to fill the identified ISR capability gap.

The Platform

The two engine King Air 350 Extended Range (ER) aircraft can land on gravel airfields under 3,000 feet in length, can perform medium-altitude surveillance over a designated area for more than 7 hours, fly back 100 Nautical miles to base, and still land with fuel on board. [32] An initial estimate of eight to ten aircraft would be required to address the aforementioned ISR capability gap.

There would be four crew members on each surveillance flight: two pilots and two sensor operators. The operators would be responsible for the radar, EO/IR camera, the ISR recording equipment, as well as directing and coordinating the surveillance mission. Acknowledging that a more intensive analysis would be required, the author reccommends the following minimum equipment:

- SAR. It is essential that the radar be capable of tracking and identifying an unknown surface target, either moving or stationary. Additionally, the system must provide continuous and snapshot radar images of a selected ground track or location for monitoring and classification of ground targets or facilities from a safe stand-off distance. It should also incorporate a Ground Moving Target Indication (GMTI). Finally, there is a requirement for a radar recorder;

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[32] *Ibid.*

- EO/IR Camera. The main sensor for ISR operations. The camera must be able to search, detect, localize, classify, track, identify, and record contacts. The turret should also house a Laser Target Designator (LTD) to improve its pointing accuracy which would greatly enhance any training scenario during Joint Exercises in support of the Army;
- Common Cockpit. In order to capitalize on the use of the aircraft as an intermediate force employment and force generation tool, the choice of cockpit avionics and displays must be consistent with what is available on the larger platforms. For instance, the aircraft shall have a traffic collision avoidance system (TCAS) similar to those on the CC-130 and CP-140. This also includes an integrated navigation system so that the aircraft are compliant with ICAO regulations[33];
- BLOS Streaming Video. Video can be streamed directly to the commander for SA and decision making. This requirement directly addresses the "timeliness" aspect of the information provided;
- Multiple Radios. It is essential that the aircraft be capable of communications with joint forces and control agencies. Additionally, from an overland perspective, the manned platform has a much wider field of view. This makes it ideal for target search and identification because the situational awareness (SA) of the entire battle space is much higher. That SA can be transferred to ground operators or back to a Joint Operations

[33]ICAO international website, Last Accessed, 10 May 2014, http://www.icao.int/publications/Pages/default.aspx

Center through chat or voice commentary. Furthermore, in a Search and Rescue Scenario, control and coordination of maritime, ground and air forces could also be performed. In order to maximize the space onboard the platform, multi-band secure radios with a SATCOM capability should be acquired.[34] Additionally, a separate spare multi-band antenna should be available for support to SOF or OGDs such as the RCMP. This would allow an operator the use of their own specialized radio when coordinating with his operators.

- Automatic Identification System (AIS). All ships over a gross tonnage of 300 must have this transponder like system on board. The aircraft could use the system to identify and locate vessels and cross correlate the information with the information provided by the other onboard systems[35].
- Mission Computer System. This system could be similar to the Overland Equipment Mission Suite used on the CP-140 Aurora. Essentially, the sensors are required to cross communicate and be integrated into a common operating picture. The computer would allow for the fusion of the sensor data at a tactical level.

Interoperability

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[34] Please note that there are multiple radio products in the market that could fulfill this requirement. As an example of a multiband radio please see the following website: https://www.rockwellcollins.com/sitecore/content/Data/Products/Communications_and_Networks/Communication_Radios/AN-ARC-210_Gen_V_Programmable_Digital_Communication_System.aspx

[35] United States, U.S. Department of Homeland Security, "Types of Automatic Identification Systems", last accessed 4 May 2014, http://www.navcen.uscg.gov/?pageName=typesAIS

The CAF must attempt to procure systems that allow for joint interoperability. For instance, using the same communications systems as the army would allow for the passage of timely information. Similarly, if the same EO/IR data collection systems are used then the sharing of collected data between RCAF platforms also becomes easy as the post flight data will be in identical formats. Finally, these complex systems always have technological insertion milestones built into the projects. If the CAF is not using the same equipment jointly, interoperability can quickly become a problem if a different system does not follow the same technological upgrade path.

Benefits to the CAF

Although eight to ten aircraft will still not allow for 24-hour persistent ISR coverage of Canada's AOR, it could at least close the identified capability gap. The aircraft would patrol Canada's coastal and littoral waters in support of ISR taskings, provide ISR support to OGDs, and support domestic Army training. As opposed to the contracted PAL surveillance, it would have the secure communications and manning required to perform Canada's defence and security role. The use of this aircraft for simple ISR taskings will also provide significant relief for the CP-140 Aurora which is limited in the amount of hours it can fly yearly. It also allows the CP-140 to concentrate on the more complex missions it is receiving due to the Block 3 upgrades. The King Air 350 ER will also ease the eventual transition of operators to UASs as all the sensors on board will be similar to those used on any given UAS.

With respect to training, the aircraft could serve as an intermediate platform for aircrew as they await their OTU slots at the training squadrons. They would benefit from gaining operational flying experience that they could then bring to the larger aircraft. This

would not only be ISR, but also Arctic operations experience. Similarly, by ensuring that the cockpit avionics are consistent with the larger platforms, the transition to the larger platforms will be easier. This would reduce the amount of remedial training that is currently occurring on the larger platforms.[36]

Logistically, using the King Air 350 ER platform is a logical choice. The SOF is also looking at this platform for their use. Although the sensors may not be the same, procuring the same airframe as the SOF allows for a second source of spares within the CAF inventory, such as engines or landing gear. There would also be a cost savings as items could be purchased in larger amounts which would result in a lower cost per item. Finally, although there is an initial outlay to procure the platforms, the hourly cost of using the platform as an intermediate ISR platform is significantly cheaper than the CP-140 Aurora.

CONCLUSION

The requirement for persistent, timely and accurate information within the Canadian AOR is identified in the national security policy documents. The Canada Defence First Strategy further refines the policies and outlines three roles for the CAF: Defend Canada, defend North America, and contribute to international peace and security. In order to fulfill these roles, the CAF must have the capacity to conduct daily domestic and continental operations, including in the Arctic. The concept is further defined in the RCAF sense doctrine. Essentially, the sense function provides the

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[36] LCol Russ Defer, Commandant of 1 CFFTS, telephone conversation with author 5 may 2014.

commander the SA required to make timely and accurate decisions faster than his opponent. This is accomplished through ISR.

However, the reality is that the size of the Canadian AOR does not allow for persistent, nor timely ISR. Additionally, a large portion of the area is in the harsher climate of the Arctic. Contributing to the capability gap, there are also multiple threats to Canada's sovereignty that must be countered. The threats outline the need for ISR to thwart the unlikely possibility of a direct or asymmetric attack from an opposing force. Similarly, ISR is required to manage the more likely threats to sovereignty such as illegal immigration, environmental pollution, overfishing and criminal activity. The only way to tackle the problem is through the employment of an ISR SoS.

To further define the ISR capability gap, one must first look at the current CAF ISR SoS capabilities. RADARSAT 2 is currently used as a wide area sensor than can cue other sensors to a TOI. However it has a predictable flight path and there are some gaps in the coverage. Helicopters and fixed wing aircraft are used as "pouncer" aircraft when a TOI is identified. Fixed wing aircraft are inherently better ISR platforms due to their speed, endurance, and harsh weather capability. Patrols in the inner and middle zones of the Canadian AOR are currently performed by a combination of contracted PAL services and the CP-140 Aurora. Performing these simple ISR missions with the over qualified CP-140 is an expensive way to accomplish the task.

As a corollary to defining the ISR Gap, there is a growing aircrew training gap. Pilots, ACSOs, and Aesops are losing their perishable flying skills while they wait twelve to eighteen months for their OTU. The MEUF was created in an attempt to help the pilots address the growing gap but it only has two aircraft and only provides for pilot training.

The author then proposed a viable option to help close the identified capability gap and address the instability of the training flow. The King Air350 ER is already in use in multiple countries as an ISR platform. The platform would be used domestically and has the flexibility to work out of small airstrips and remain airborne for seven hours. As a rough estimate, eight to ten aircraft would significantly close the ISR gap. As a minimum it would require a GMTI capable radar and an EO/IR camera that would also have a laser target designator to help with CAF joint training. Additionally, the cockpit would have avionics that are similar to the larger multi-engine platforms to allow for an easier pilot transition. The communications system would require both multiband/SATCOM radios and the ability to stream video beyond line of sight. This would allow for timely dissemination of ISR data. Furthermore, the aircraft would incorporate an AIS to help identify ships while on coastal patrols. There is also a need for recorders for each sensing system. Finally, a mission computer is required to help fuse the data and integrate into a common operating picture. Interoperability must be considered during the procurement. This allows the CAF to capitalize on similar technological upgrades paths and allows for the efficient sharing and use of ISR data.

There are a number of benefits to such a procurement. The aircraft could be used to patrol the inner and middle zones of Canada's AOR, freeing the CP-140 Aurora for more complex tasks. It could also perform patrols or be cued by other sensors for use in the Arctic out of small airfields. The platform would also ease the eventual transition of operators to UASs. With respect to training, the aircraft would serve as an intermediate step where operators can gain operational experience and keep their aircrew skills honed. This will result in less remedial training on the larger more costly platforms which will in

turn result is less money devoted to force generation and more hours devoted to force employment. Logistically, the use of King Air 350 ERs by SOF allows for the sharing of spares within the CAF inventory and a cost savings. Finally, as always, it comes down to the bottom line on a spreadsheet. Although there is an initial outlay, the cost per hour of flying for this platform will be significantly less than that of any other ISR platform. In other words, this is one of the most efficient ways to fill the Canadian ISR capability gap.

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