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EXERCISE NEW HORIZON

THE NEED FOR A LONG-RANGE ARMED ISR CAPABILITY:

Will the Canadian Multi-mission Aircraft fulfill the need?

By/par Lieutenant-Colonel Luc Boucher

INTRODUCTION

> [In Canada, national security] is the preservation of a way of life acceptable to the Canadian people and compatible with the needs and legitimate aspirations of others. It includes freedom from military attack or coercion, freedom from internal subversion, and freedom from the erosion of the political, economic, and social values which are essential to the quality of life in Canada.[1]
>
> *W.D. Macnamara and A. Fitz-Gerald, 2007*

Recent Strategic Planning guidance for the Canadian Forces (CF) identifies surveillance and reconnaissance as necessary components of the greater "information and intelligence" capabilities, and categorizes it as a "national level enabler," essential to the conduct of "combat operations."[2] Armed with the prerequisite directives, the Chief of Force Development (CFD) is actively pursuing the integrations of all capabilities into a system-of-systems,[3] aimed at addressing the capability needs required to satisfy the protection of our nation's security and sovereignty.

Government and CF policy documents consistently indicate that there is an essential need for persistent Intelligence, Surveillance, Reconnaissance and Control (ISR+C) capability. They go further in stating that a modern CF is one that has a combat-

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[1] W.D. Macnamara and Ann Fitz-Gerald, "A National Security framework for Canada." *Policy Matters*, vol 3, no 10 (October 2002), 8, in Department of National Defence, B-GA-400-000/FP-000 *Canadian Aerospace Doctrine*, (Ottawa: DND Canada, 2007), 19.

[2] Department of National Defence, "Strategic Capability Planning for the Canadian Forces," http://vcds.mil.ca/dgsp/pubs/rep-pub/dda/strat/; Internet; accessed 4 March 2009.

[3] A system-of-systems is an assemblage of components that individually may be regarded as systems and that possess two additional properties: Operational independence of the components (If the system-of-systems is disassembled into its component systems, the component systems are able to operate independently; that is, the component systems fulfill customer or operator purposes on their own), and Managerial independence of the components (Component systems are separately acquired and integrated, and maintain a continuing operating existence independent of the system-of-systems). Source: Department of National Defence, "Collaborative Capability Definition, Engineering and Management," http://www.capdem.forces.gc.ca/html/definitions_e.html; Internet, accessed 2 April 2009.

capable force and the required equipment to carry-out assigned tasks.[4] Despite this common refrain, very little has been done to rationalize and support the critical capability required to fulfill the full spectrum of operations asked of the CF. While significant initiatives and projects aimed at developing an integrated aerospace ISR+C capability into a "systems-of-systems" are underway, unless program measures are undertaken by the Canadian government, a serious capability gap will develop within the Air Force's (AF) ISR+C arsenal.

This paper will argue that, Canada needs to invest in a modern long range, multi-role *Armed ISR+C capability*, enabling the CF to project aerospace ISR+C in both its domestic and expeditionary roles.[5] The paper will focus on the impact of not generating the reach and fire-power necessary to interdict an unwanted and hostile threat to Canada, and conclude that the Canadian Multi-misson Aircraft (CMA) program must include both the ISR functions, as well as a modern weapon system.

I will begin by providing background information on the Government's position on aerospace capability requirements and identify the evolving threats to Canada. Next, the paper will define ISR+C in the context of the environments supported by aerospace platforms. This will lead to the identification of key existing aerospace capabilities, future acquisitions programs, and the potential capability gap that may occur if the Canadian

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[4] Department of National Defence, *Canada First Defence Strategy* (Ottawa: Public Works and Government Services Canada, 2008), 3.

[5] In Canada, the military is structured under a unified "Canadian Forces," where the Army, Navy, and Air Force are considered "environments" of the CF. For the purpose of this paper, when referring to the Air Force, it is understood within the construct of the CF.

government does not support the full capability requirements identified for CMA.[6] Finally, I will argue that while costly, arming the CMA is essential to providing Canada with a flexible, time responsive, multi-role and combat-capable aerospace platform.[7]

It is not the intent of this paper to conduct a detailed inventory of all ISR assets in the CF inventory, but rather, to address those aerospace capabilities capable of both ISR as well as weapon delivery functions. It will cover principally the *sense* and *act/shape* domains of AF functions.[8]

BACKGROUND

Government guidance

The 2008 Canada First Defence Strategy (CFDS) illustrates clear roles and missions for the CF.[9] The strategy describes the need for the CF to be a "fully integrated, flexible, multi-role and combat-capable military, working in partnership with the knowledgeable and responsive civilian personnel of the Department of National Defence."[10] It further states that "our military must be effective, relevant and responsive, and remain capable of carrying out a range of operations, including combat."[11] To support this strategy, the CF must therefore be given all the required funding and support

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[6] For a detailed look at the existing CF capability gaps, see: Colonel M.W. Hache, "DND's Intelligence, Surveillance and Reconnaissance (ISR): Eyes and Ears for Canada" (Toronto: Canadian Forces College National Securities Studies Course paper, 2003), 5.

[7] DND, *Canada First Defence Strategy…*, 5.

[8] Department of National Defence, B-GA-400-000/FP-000 *Canadian Aerospace Doctrine*, (Ottawa: DND Canada, 2007), 37.

[9] DND, *Canada First Defence Strategy…*, 2.

[10] *Ibid*., 3

[11] *Ibid*., 2.

to deliver these capabilities. Supporting the CFDS objectives, the AF Vision Statement illustrates the need for an "Air Force based on excellence and professionalism, equipped, trained and ready to prevail in combat, with the reach and power to effectively contribute to national and international security." This statement aims at re-orienting the AF to respond to the 21st Century security environment.[12]

Equally important, the Canadian International Policy Statement states that the "role of the Canadian Forces in protecting Canadians and their interests and values will remain essential in the future."[13] Not only will the demand on the military not diminish, but that it will increase in the years ahead for both domestic and international operations. "Canada must possess a military that is well adapted to the evolving security environment and ready to respond to the country's future needs."[14] The CF must have "the capability required to effectively support Canada's strategic requirements at home as well as to support Canada's interests abroad."[15] This statement illustrates that the CF not only needs surveillance capabilities, but equally important, it needs the capability to *command*, *sense* and *act* while being fully integrated with other ISR+C assets into a "system of systems".

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[12] Department of National Defence, A-GA-007-000/AF-002 *The Aerospace Capability Framework* (Ottawa: DND Canada, 2003), 54.

[13] DND, *Canada's International Policy Statement: A Role of Pride...*, 1.

[14] DND, *Canada First Defence Strategy...*, 1.

[15] Department of National Defence, "SYNOPSIS SHEET (Identification) Project 00001417 – Canadian Multi-Mission Aircraft," September 2008, 1.

The evolving threat

The 20th century kept Canada on its toes with the ever present threat of an attack by the Soviet Union. As a result, Canadian Army units were permanently deployed to Europe, ready to engage in a conventional combat role. The Navy was busy patrolling Canadian and international waters with its state of the art and capable Anti-Submarine Warfare destroyers and frigates. The Air Force was defending two fronts. The European theatre was regularly patrolled by fighter aircrafts, ready to engage the enemy in a ground attack role or interdict the Soviet fighters in an air-to-air combat role. Domestically, the same fighter force fulfilled an air-defence role, under the watchful eye and direction of NORAD. The maritime air component developed a multi-role capability specializing in anti-submarine warfare, and was busy chasing Soviet nuclear submarines carrying ballistic missiles around the world. On the home front, they were engaged in sovereignty patrols as well as providing support to other government agencies.

These roles came with the allocation of a considerable amount of resources to accomplish each mission. That is, until the 1990's, when the Soviet threat essentially vanished and with it, the CF suffered significant resources "shrinkage".[16] Now well into the first decade of the 21st century, Canada faces a complex array of new challenges, particularly given the terrorist attacks of September 11th 2001 (9/11).

The threat to Canada has changed from a well defined, predictable and so called "conventional" one, to an asymmetrical threat difficult to comprehend. The terrorist

[16] Lieutenant-Commander D.L. Coffey, "Who Stands Guard? Contracting aerial surveillance of Canada's Exclusive Economic Zone" (Toronto: Canadian Forces College Command and Staff Course New Horizon Paper, 2004), 3.

attacks of 9/11 accentuated the global state of insecurity and uncertainty. In *al Qaeda's Maritime threat*, Lorenz states that "[t]errorism has further exposed the vulnerabilities of the modern, increasingly open, and interdependent societies to highly organized terrorist groups."[17] For Canada, this means economic and resource based menaces, geographic territorial claims, terrorism emerging from failing states and potentially domestic extremist movements, all being recognized as having a potentially devastating effect on Canadian's security. Barber, from the Directorate of Maritime Strategy at National Defence Headquarters states:

> Since the international terrorist threat is likely to continue to be a dominant security issue for at least the next several years, the physical security of our ocean approaches will be a primary concern for the Canadian Government.[18]

In a world filled with transnational problems, the threat of terrorism constitutes a legitimate attack on Canada's interest and values and is at the forefront of Canada's defence strategy.[19] A *general maritime outlook* spanning to 2025 supports a considerable growth in maritime surface traffic, primarily emerging from the Far East, where a change in world maritime power is being noticed.[20] Also noticeable is a growth in submarine fleets in the Indo-Pacific region, as well as in China and Russia, where both countries are revitalizing their submarine fleets with improved capabilities and reach. Inevitably, this

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[17] Akiva J. Lorenz, "Al Qaeda's Maritime Threat," *International Institute for Counter-Terrorism*, (April 2007) [journal on-line]; available from http://www.scribd.com/doc/39840/Al-Qaedas-Maritime-Threat#document_metadata; Internet; accessed 3 April 2009.

[18] Department of National Defence, "The Maritime Future Security Environment," *The Maritime Warfare Bulletin*, (2005): 5.

[19] DND, *Canada's International Policy Statement: A Role of Pride…*, 1.

[20] The Heritage Foundation, "China's Submarine Challenge," http://www.heritage.org/research/asiaandthepacific/wm1001.cfm; Internet; accessed 3 April 2009.

significant transformation of the world maritime scene may have significant impacts on Canada's security and sovereignty.

On the domestic front, the requirement for sovereignty initiatives is becoming more and more prominent. Climate change and its associated environmental impact will cause an increase in commercial presence (resource exploitation) and traffic (polar navigation routes) in the Arctic.[21] According to Canadian maritime analysts, an attack on Canada's oceanic traffic and trade constitute perhaps the most significant threat as "the volatile mix of global political, economical, social, technological and military conditions will continue to bring great stress to the international order."[22] Canada is certainly not immune to such threats.

So, what does this "new threat" mean for the CF? In response to such pressures facing Canada, the CF must put in place active control capabilities to effectively counter or intervene in response to potential unwanted activity approaching, or operating within Canada's sovereign territory.[23] In the context of aerospace capabilities, this entails having ISR+C capabilities that cover the maritime surface and sub-surface environments, the overland interior and the Arctic Areas of Responsibilities (AORs).

Given clear government directives and an understanding of the evolving threat facing Canada, the next section will define ISR+C as it applies to aerospace capability.

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[21] DND, *Canada's International Policy Statement: A Role of Pride…*, 17.

[22] DND, "The maritime future security environment," *The maritime Warfare Bulletin*, (2005): 11.

[23] DND, Strategic Vectors…, 27.

ISR DEFINED

> [R]econnaissance is find it; surveillance is keep in touch with it; and intelligence is why you give a damn in the first place.[24]
>
> *Former U.S. Secretary of Defence Ronald Rumsfeld*

While simplistic in nature, former U.S. Secretary of Defence Rumsfeld's definition of ISR captures its true meaning. But one must breakdown ISR into its three functional components before one can understand their combined synergistic effects. *Intelligence* is the product resulting from processing data and information concerning a foreign nation, hostile or potentially hostile forces.[25] This product is then used for the planning and preparation of military operations. In broader terms, "[t]he essence of intelligence is improved situational awareness for decision makers,"[26] enabling further military operations.

Surveillance is defined as "[s]ystematic observation by technical sensors or human beings. This implies continuous 24 hours a day, seven days a week surveillance of areas or forces of interest."[27] Surveillance is thus a sustained process enabling the gathering of information by collectors having persistent observation capability (prolonged loitering) over a given area, without being focussed on a specific target.[28]

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[24] This was a summarized definition of ISR provided by Secretary of Defence Donald Rumsfeld, quoted in Rich Haver, "Why ISR? The Significance of an AF DCS for ISR" (prepared comments for the 55th Wing ISR Symposium, Omaha, 24 May 2007).

[25] Commander Josh Barber, "An Intelligence, Surveillance and Reconnaissance (ISR) for the Canadian Forces," *Canadian Military Journal*, Vol. 2, No.4, (Winter 2001-2002): 42.

[26] Lt.Gen David A. and Maj. Greg Brown, "A House Divided: The Indivisibility of Intelligence, Surveillance, and Reconnaissance." *Air & Space Power Journal*, Vol XXII, No 2 (Summer 2008): 7.

[27] Barber, *An Intelligence, Surveillance and Reconnaissance*…, 42.

[28] Deptula, *A House*…, 7.

Finally, *reconnaissance* consists of "directed mission(s) to obtain specific information."[29] This is achieved by visual observation or other detection methods, to generate information about the activities and resources of an enemy or potential enemy.[30] Reconnaissance is usually target specific where the mission is planned and executed with the aim of gaining specific information within a given, and often limited period of time. As with surveillance, the products of reconnaissance missions assist in building the required situational awareness of the enemy's situation.

Having defined ISR by individual components, ISR used as a collective term was first used in the mid 1990s, and can be further defined as "an activity that synchronizes and integrates the planning and operation of sensors, assets, and processing, exploitation, and dissemination systems in direct support of current and future operations." It is further defined as an "integrated intelligence and operations function."[31]

In *A House Divided: The Indivisibility of Intelligence, Surveillance, and Reconnaissance*, Lt-General Deptula states that ISR is more of a "principle" where each individual component directly interacts with each other to deliver the "end product" to the war-fighter. Intelligence relies on the information gathered by the surveillance and reconnaissance activities. Conversely, surveillance and reconnaissance missions are supported and, to some extent, generated by intelligence. One is dependent on the other

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[29] Barber, *An Intelligence, Surveillance and Reconnaissance*…, 42.

[30] Department of National Defence, B-GA-400-000/FP-000 *Canadian Aerospace Doctrine*, (Ottawa: DND Canada, 2007), 65.

[31] Joint Publication (JP) 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001 (as amended through 17 October 2008), 273. http://www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf; Internet; accessed 26 January 2009.

and to the user of the end product, ISR is, and should remain, a transparent and an indivisible principle.[32]

The AF defines the "control" found in the acronym ISR+C as "the ability to actively respond to, control, and potentially eliminate the activity."[33] Aerospace control capabilities are essential for the control of aerospace, maritime, and land environments. It is an essential enabler for success in joint military operations.[34] Combining ISR and Control capabilities into a single platform allows for increased flexibility of employment, thus providing the supported Commander not only with improved situation awareness (SA), but also the ability to engage a threat with force if required.

ISR is not a new concept. Most aerospace functions involve ISR in some form or another. For instance, fighters and maritime patrol aircraft (MPA) carry sensors capable of producing ISR products and assisting in the collection and production of intelligence data. The data can be processed post-flight or concurrently during the mission and used for the development of attack solutions leading to weapon deployment. ISR is therefore an inherent capability for many aerospace platforms.[35]

Having defined ISR and its relationship to aerospace control, ISR+C emerges as a unique yet essential function for the AF. In the next section, a review of existing AF ISR+C capabilities will be conducted. This will lead to the identification of existing gaps in AF ISR+C capabilities.

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[32] Deptula, *A House*…, 6.

[33] DND, *Strategic Vectors...*, 36.

[34] *Ibid*., 36.

[35] Major Steven Maceda, "Control of Theater Intelligence, Surveillance, and Reconnaissance for the Ground Commander." Air & Space Power Journal, Vol XXII, No 4 (Winter 2008): 60.

THE STATUS QUO

While this section will address the various AF platforms currently in service, it is important to remember that these assets were procured to address very specific and often unique functions. The resulting capability shortfalls associated with aging platforms and their lack of modernization efforts resulted in a "shrinkage" of aerospace capabilities during the last decade. Fortunately, many initiatives are underway to resolve these deficiencies.

The following section will review the primary aerospace assets dedicated to fulfilling ISR+C functions within three environments – the air, surface and sub-surface environments.[36]

Air environment

AF platforms and assets have a varying range of ISR+C capabilities. The CF-188 Hornet is the only platform in the CF arsenal capable of responding to an airborne threat and for effectively controling the aerospace environment (air-to-air).[37] It will remain the workhorse for the AF in the aerospace control role supporting Canada's NORAD commitment until the fleet reaches its expected life expectancy (ELE) of 2017 to 2020.

The Hornet, however, has limited reach capability and must depend on a tanker (air-to-air refuelling) in order to extend its range over Canada's northernmost archipelago. Many shortfalls associated with the aging Hornets should be addressed by

[36] While "space" can be said to be a fourth environment worth considering, it will not be covered and is beyond the scope of this paper.

the Next Generation Fighter Capability (NGFC), a project well underway to replace the only fighter aircraft fleet in the CF. The NGFC is expected to enter service between 2018 and 2021, and should maintain the same functions as the Hornet, albeit with enhanced performances and efficiency.[38] Long-range/endurance will remain a constraint for the NGFC.

The CP-140 Aurora (ELE 2020), originally designed for an anti-submarine surveillance and attack role, has very limited air surveillance capability and offers no weapon delivery supporting the "act" domain in the air-to-air role. Its sensor suite has limited airborne surveillance capability, but is not optimized for this role. It has the endurance to loiter on-station for extended periods of time, and at present, the Aurora is the only air asset capable of rapidly reaching remote areas of responsibilities such as the high Arctic.

Surface environment

The surface environment includes targets operating either on land or water (such as surface ships). In the land environment, the recently modernised Hornet weapon system has added to its air-to-air capability a precision weapon delivery capability in the air-to-surface role, making it a very capable air-to-surface strike platform. Along with the Hornet's precision guided munitions (PGM) strike capability, both the Aurora and the CH-146 Griffon (ELE 2021) have "sense" capability enabling detection, classification and identification of targets.

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[37] DND, *The Aerospace Capability Framework*, 35.

The Griffon is currently being fitted with INGRESS (Interoperable Griffon Reconnaissance Escort System) a combination of electro-optics and infrared (EO/IR) system and door mounted guns for air-to-ground attack capability, which is mainly for use in an escort role to other units/platforms.[39] The Aurora, while also fitted with a very capable EO/IR system, is currently limited to domestic overland operations, where it is primarily used for sovereignty patrols in the Arctic and in support to other government departments (OGD). The Aurora has no air-to-surface weapon system.

Unmanned Aerial Vehicles (UAVs) such as Sperwer and Heron, are a recent addition to the surface (land) surveillance suite, with EO/IR sensors providing real-time full motion video (FMV) to the supported commander. While in high demand in Afghanistan, currently none of the UAVs operated in the CF are employed domestically nor carry air-to-surface weapons.

Finally, in the maritime surface environment, the Aurora and the CH-124 Sea King (ELE 2010) are optimized for their "sense" capability and neither have anti-ship weapon systems. The Sea King can be fitted with a door mounted machine-gun and is used for ship boarding operations. Experiments with UAVs in the maritime environment have had limited success, and are not currently employed in that role.

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[38] Data extracted from a presentation prepared by the Directorate of Air Strategic Plans for the Chief of Air Staff, (Ottawa: 2009).

[39] DND, *The Aerospace Capability Framework…*, 37.

Sub-surface environment

In the maritime sub-surface environment, the Sea King and the Aurora have sub-surface *sense* and *act* capabilities.[40] Both are well suited for anti-submarine warfare (ASW), but lack modern sensors to effectively operate against a modern submarine threat. Although "capable," both the Sea Kings and Auroras are in critical need of major modernization (currently underway for the Aurora) in order to maintain their operational capability until they reach their respective ELEs. The Cyclone Maritime Helicopter project is expected to reach Final Operational Capability (FOC) in 2016 and will replace the aging Sea King. Similarly, the CMA project has been initiated and is meant to replace the Auroras (CMA FOC of 2020).

CAPABILITY GAP

Given the aforementioned ISR+C capabilities, a gap exists in the AF's arsenal in the *sense*, and more importantly, the *act* domains. This section will use current Canadian domestic operations as a guiding scenario to determine the need for a long-range armed ISR+C capability.

The Canadian Arctic and maritime approaches pose by far the most challenging areas of concern to effectively maintaining Canada's sovereignty. Defending this sovereignty demands that Canada maintains the ability to act, and this means having the capability to use force if and when required. With limited capability to detect, classify, identify and project the required level of "control" measures to counter a threat – be it

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[40] *Ibid.,* 37.

airborne, surface based, or sub-surface – Canada's sovereignty becomes vulnerable. The only current aerospace capabilities partially capable of supporting a northern operation are the Hornets and the Auroras, and with very limited effect.[41] Unless immediate actions are taken soon, the ISR+C capability gap risks widening to a point where the AF becomes operationally incapable of supporting Canada's defence strategy.

It could be argued that there is no need to project aerospace control in the far north, where satellite based surveillance systems, such as RadarSat II, provide adequate coverage and cues other CF assets in the national surveillance system. [42] Equipped with RadarSat II and supplemented by the existing NORAD North Warning System (NWS), perhaps Canada can afford to "wait and see," taking the desired action only once the "target" reaches within range. While an excellent component of the ISR "system-of-systems," surveillance satellites alone do not have the capability to explicitly discriminate between legitimate and illegal activities taking place, let alone to positively identify a target and engage it should the need arise. Thus, while satellites serve an important role of providing broad area surveillance, they do not provide for discrete target identification nor do they provide the means to control or interdict any intruding targets.

Government officials have suggested that having a permanent military presence in the high Arctic would satisfy Canada's Arctic sovereignty needs. Through the "Northern-based initiatives," an increased Arctic presence, in addition to the existing Rangers, satellite warning systems, and routine northern patrols by the Auroras, Canada's

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[41] David Reade, "AURORA: Guardian of the North: Why Canada needed to upgrade the CP-140 Aurora" (Halifax: 2008), 7.

[42] Major M. Addison, "A Comprehensive Aerospace Surveillance System for the Canadian Arctic" (Toronto: Joint Command and Staff Program New Horizon Paper, 2007), 14.

sovereignty would be preserved.[43] Arguably, it would provide an increased presence on the ground but would afford the CF very little capability to react to a threat, especially during the winter months. Ocean travel would be another way to increase military presence in the North, but navigation remains very hazardous in most areas of the high Arctic, and is limited to only a few months per year due to ice coverage. Thus aerospace control remains the most likely means to enforce our security and sovereignty concerns in the Arctic in the near future.

Advocates of UAVs suggest that their platform could offer the desired level of persistent surveillance over the Arctic (and maritime approaches) but the platform remains untested and unproven this far north.[44] In current operational use in Afghanistan, UAVs have demonstrated great potential. Recent experiments with the Atlantic Littoral ISR Experiment (ALIX)[45] have demonstrated that while UAVs can be an effective ISR platform, there are limiting factors to their operational employment in austere environments such as the high Arctic and the maritime environment.[46] They have limited effectiveness in the high Arctic due to a lack of line-of-sight communication with geostationary satellites above 66 degrees north.[47] UAVs are also limited to the *sense* domain and it is very unlikely to see UAVs employed in the *act* domain domestically.

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[43] Department of National Defence, Extract from Minister Peter McKay's speech, "Announcement of the Junior Canadian Rangers Programme Expansion," http://www.forces.gc.ca/site/news-nouvelles/view-news-afficher-nouvelles-eng.asp?id=2753; Internet; accessed 4 March 2009.

[44] Major S.G. Sarty, "The CF MALE/HALE UAV: Not an Immediate Panacea" (Toronto: Joint Command and Staff Program New Horizon Paper, 2008), 14.

[45] National Defence and the Canadian forces, "Atlantic Littoral ISR Experiment (ALIX)," http://www.forces.gc.ca/site/news-nouvelles/view-news-afficher-nouvelles-eng.asp?id=1432; Internet, accessed 28 February 2009.

[46] Sarty, *The CF MALE/HALE UAV…*, 14.

[47] *Ibid*., 15.

Notwithstanding its aging sensors and weapon systems, the Aurora is the only dedicated long range ISR+C platform that can dwell/loiter over long distances. It is important to note that the Aurora's main role has evolved over the years from ASW to ISR+C, given the change of threat since the end of the Cold War. In spite of ongoing and future projects to modernize the Aurora, it remains limited in its capability to project power due to its lack of air-to-surface weapons. This leaves Canada with a very limited ISR+C capability in support of the AF's commitment to maintaining territorial security and sovereignty.

Having reviewed the key CF ISR+C capabilities, and future fleet replacements, [48] the next section will argue that the way ahead for the CF is to pursue the CMA project with the full inclusion of a weapon capability in order to fully support the government policy and directives.

THE WAY AHEAD

The CMA project is being developed to solve the ISR+C capability gap. It is the only ISR+C initiative aimed at fulfilling the manned long-range *sense* and *act* capability requirements for the CF. While essential to the support of Canada's strategic ISR+C requirements, the CMA project High Level Mandatory Capabilities (HLMC) leaves the arming of the future platform as a "Rated" requirement. This means that this requirement has a very high risk of being dropped from the project, due mainly to high cost and

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[48] New fleet procurement consists of the CMA, the NGFC, the Cyclone maritime helicopter and the Joint Unmanned Surveillance Target Acquisition System (JUSTAS). JUSTAS phase I is meant to address the overland international demand for persistent ISR, while phase II will address the maritime

technical developmental risks. [49] As it stands, the project is capped at three billion dollars, and is aimed at delivering a fleet of ten to 12 aircraft (excluding life cycle costs). This level of funding is not likely to be sufficient for the development of an entire fleet and will inevitably lead to significant reductions in project scope. First on the list of requirements to be removed from the CMA would be the weapon systems ("rated" requirement).[50] Failing to arm the CMA will leave a significant capability gap in the CF's overall ISR+C system of systems.

As pointed out in the CFDS and AF Strategy documents, a modern AF needs the ability to enforce control in both domestic and expeditionary operations. Arming the CMA would provide the CF with the reach and capacity to project control as the situation dictates, as well as supporting all mission tasks while contributing to the *command*, *sense* and *act* domains.

To satisfy all long-range ISR+C roles, the CMA project must ensure that the platform selected has the required weapon systems to "act" against sub-surface and surface threats.[51] In addition, the fleet size must be such that it meets both the capability and capacity needed to provide operational viability.[52] Understandably, the cost to develop and procure the CMA represents a significant challenge and puts the project in jeopardy.

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domestic component. While JUSTAS phase I FOC is expected for 2018, phase II is still undetermined. Source: Directorate of Air Strategic Plans for the Chief of Air Staff, (Ottawa: 2009)

[49] Department of National Defence, "SYNOPSIS SHEET (Identification) Project 00001417 – Canadian Multi-Mission Aircraft," September 2008, 1.

[50] *Ibid*., 2.

[51] David Reade, "AURORA: Guardian of the North: Why Canada needed to upgrade the CP-140 Aurora" (Halifax: 2008), 1.

To mitigate the cost, the AF must look at possible options and identify the critical AF capabilities that provide more than a "niche" function, and where "multi-role" is favoured over single function. As a result, an AF fleet "transformation" may be required to reduce or re-allocate resources to the most critical capability needed. For instance, a reduction in the number of aircraft to be procured for the NGFC fleet could offset the cost of arming the CMA and procuring additional platforms. This would result in an optimized multi-role capability while retaining the required NGFC to support Canada's NORAD commitment.

It is important to realize that pursuing the development of a new ISR+C capability aligns perfectly with existing fleet expertise and experience. The Long Range Patrol (LRP) community is extremely well suited to carry out ISR+C missions, and it has been involved in such a role for many decades. The LRP crews' strong core skills in anti-submarine warfare (ASW) and anti-surface warfare (ASUW) are well suited for other inherent roles such as overland ISR+C. As Lt.Gen. David Deptula, USAF, recently pointed out on the benefit of synchronized platforms:

> Increasingly, a single platform executes the entire kill chain. Aircraft normally associated with strike operations have excellent sensors on board, and in many cases their sensor data can be networked to others who can turn it into actionable intelligence.[53]

He indicates that while USAF pilots generally feel uncomfortable linking the sensor platform to the shooter, the USN has leveraged and mastered this arrangement with the P-3C Orion aircraft. As a result, the Navy's traditional need for immediate prosecution of submarine targets has translated into a seamless transformation of its ASW

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[52] DND, *The Aerospace Capability Framework*…, 17.

[53] Deptula, *A House*…, 7.

platform into an armed, manned ISR aircraft (P-3C modernized Aircraft Improvement Program (AIP) version). Equipped with AGM-65 Maverick and AGM-84 Harpoon, the P-3c AIP was further outfitted with a land-strike weapon, the Standoff Land Attack Missile (SLAM), a derivative of the AGM-84 Harpoon.[54]

The LRP platform is a quick reaction, self contained (self cueing), multi-sensor platform, which incorporates tasking flexibility, reach and long-dwell time. Its traditional roles have evolved to become effective in a wide range of scenarios from ASW to counter narcotics with the distinct ability to be dynamically re-tasked. A veteran of OPERATION IRAQI FREEDOM and ENDURING FREEDOM, Major Gary Burg remarks:

> In today's operations, the land component has a great need for reconnaissance platforms; some people have even called it a "limitless hunger". This need far exceeds the assets available to cover requirements, some of which are for armed-reconnaissance to enable immediate strikes against the enemy during time-critical operations such as indirect-fire setups and emplacement of improvised explosive devices.[55]

It only makes sense to capitalize on the LRP community and its expertise by fully developing and leveraging the CMA long-range ISR+C capability so that it can support all domains. Future long range ISR+C capability should afford the commander the ability to project forces from one single platform. Innovative employment of the LRP aircraft for direct support to Special Operations Forces, force protection to Land Forces during expeditionary operations, and maritime interdiction operations (MIO) has proven to be

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[54] *Ibid*., 7.

[55] Major Gary L. Burg, "Asymmetric Air Support," *Air & Space Power Journal*, Vol XXII, No 4 (Winter 2008): 36.

effective and essential to supporting Canada's interests abroad. It is important to realize that all these tasks are equally adaptable to domestic operations.

A more traditional role for LRP aircrews, ASW is, and will most likely remain, the most demanding and challenging role. It is a complex, and some would argue "perishable" skill for the aircrew and given the complexity and difficulty in maintaining a relevant ASW capability, it should remain a core function for the AF, inclusive of the required ASW weapon system.

Recent operations in Bosnia and Rwanda, and more recently, in Afghanistan and Iraq, have clearly demonstrated that a long range, long endurance (persistent) ISR+C platform can provide a decisive force multiplier effect for the supported commander.[56] The USN saw clear evidence of the utility and importance of an armed ISR capability in that the sensor-to-shooter cycle was reduced considerably. This in turn provided a timely and effective kinetic impact on operations against time sensitive targets (TST). The AIP version of the P-3C Orion created a new paradigm for the USN, taking the P-3C "overland", where it never operated before:

> [I]n 1999, during Operation Allied Force in Kosovo and Serbia, where P-3Cs on station in the Adriatic Sea cast a glance of their long-range electro-optical sensors far inland and launched AGM-84E SLAMs (Standoff Land-Attack Missiles) against targets even farther afield.[57]

USN ISR assets were also extensively used in Afghanistan to provide force protection and reconnaissance of cave complexes where Taliban and al Qaeda fighters were hiding.

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[56] Major A. Harvey, "MPA Intelligence Collection in Support of Operations," *Maritime Patrol Aviation Magazine*, 2003, 19.

[57] David Reade, "Orion Scans Terrain from Kosovo to the Hindu Kush: Venerable P-3 Aircraft Increase Situational Awareness on the Battlefield," http://www.navyleague.org/sea_power/jun_03_35.php; Internet; accessed 8 January 2009.

The P-3C AIP's ability to transmit real-time full motion video (FMV) contributed to the successful discovery, targeting and attack against Taliban fighters.[58] While the future for the P-3C AIP is very similar to that of the CF Auroras, a replacement initiative is well underway to procure a "Multi Mission Aircraft" (MMA). It is being designed to conduct the full spectrum of operations – from ASW to overland ISR+C, fulfilling the whole kill chain in a time sensitive manner.[59]

From a CF's perspective, an armed CMA would provide the supported component commander (domestic and expeditionary) with the capability to *command*, *sense* and *act* from the same platform, against sub-surface and surface threats. Such a capability should be seen as the keystone capability for the AF, one that forms a rapidly deployable, multi-role and long endurance core AF capability. An armed CMA will be equally relevant domestically when patrolling the vast expanses of Canada, or when deployed in support of Maritime or Land Forces. Faced with limited resources and having a vast and challenging territory to control, it is crucial that the CMA be fitted with armament, giving the fleet the capability to not only *sense*, but also to *act.*

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[58] David Reade, "NAVY P-3 Operations in the War on Terrorism," http://www.navyleague.org/sea_power/june_02_03.php; Internet; accessed 1 March 2009.

[59] RADM Richard E. Brooks, USN, "The Multi-Mission Maritime Aircraft and Maritime Patrol and Reconnaissance Force Transformation," http://www.jhuapl.edu/techdigest/td2403/Brooks.pdf ; Internet; accessed 1 March 2009.

CONCLUSION

> [T]he Canadian Forces (CF) needs a manned, long-range platform, capable of providing Command/ Control (C2) and Intelligence, Surveillance and Reconnaissance (ISR) with the ability to engage/control and to fully integrate with other ISR assets. This capability is required to effectively support Canada's strategic requirements at home as well as to support Canada's interests abroad.[60]

Government policies and directives clearly indicate that Canada must have a combat-capable military, with the means to defend and protect Canada's interests and values at home and abroad. In order to fulfill this need, the CF must modernize its aerospace capabilities and become an integral part of the CF ISR+C "system-of-systems." Such capability must be adapted to the evolving threat facing Canada, and address all target environments – air, land and maritime. The role of the CF in protecting Canadians remains as relevant today as it did during the Cold War and will certainly persist for the foreseeable future.[61]

A contemporary definition of ISR+C consists of an integrated principle, synchronizing intelligence, surveillance and reconnaissance as well as the control function supporting the commander in conducting military operations. While the need for ISR+C products has increased tremendously over the last few years, Commanders have adapted their operations to make full use of what highly sophisticated sensors can provide, such as full motion video and EO/IR products. However, the obsolescence of the AF fleets seriously jeopardizes mission effectiveness.

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[60] Department of National Defence, "SYNOPSIS SHEET (Identification) Project 00001417 – Canadian Multi-Mission Aircraft," September 2008, 1.

[61] DND, *Canada's International Policy Statement: A Role of Pride …*, 1.

The AF fleets are in serious need of modernization or replacement. Stovepipe fleets continue to develop their own capabilities fulfilling their niche roles within the AF. Unfortunately, the CF may not be able to afford single role fleets. Therefore future fleet procurement such as the CMA should be seen has having the potential to re-shape the aerospace capability structure across the AF.

The CMA project has the potential of meeting all essential ISR+C requirements in response to the Government's concerns with the CF's ability to act in defence of Canada's sovereignty, be it in the Arctic or in the maritime outer-limits. In fact, this will be the only capability to have the reach and required "fist" to counter a threat in those areas of responsibility, and across all domains - *command*, *sense* and *act.*

In spite of this, project cost and aircraft developmental risks currently jeopardize the CMA's future and while the project is moving ahead, the armament capability runs the risk of being eliminated from the project mandatory requirements. The AF should capitalize on existing LRP expertise to further develop a multi-role, armed CMA. Given the size and financial limitations facing the AF, considerations should be given to "overhauling" the existing fleets to better reflect the "realistic" needs of the CF as opposed to maintaining a Cold War force structure. A focus on an armed ISR+C capability could force a re-allocation of resources, thus causing a reduction in size for other fleets, a potentially essential reality for a modern CF.

By championing this initiative, the armed CMA will be an integral part of the CF C4ISR[62] framework and will constitute a key component of the ISR+C "system of systems."

[62] C4 consist of Command, Control, Communication and Computer. It is grouped together with ISR to form C4ISR, a framework that encompasses all related C2 networks, sensors, ISR platforms, and fusion centres. It is managed by Chief Force Development (CFD) under the CF C4ISR campaign plan.

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