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ISR STRIKE: THE EVOLUTION OF THE RCAF'S SENSE CAPABILITY

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Exercise *Solo Flight*

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INTRODUCTION

The revolution in military affairs (RMA) has led to rapid advances in both surveillance technologies and weaponry. Canada currently possesses a high-endurance aircraft with advanced sensors, the CP-140 Aurora, and aircraft capable of precision strike, the CF-188 Hornet. However, what is lacks is a high-endurance, intelligence, surveillance, reconnaissance (ISR) aircraft that is capable of precision strike. This capability gap represents a failing of the Department of National Defence (DND) and the Royal Canadian Air Force (RCAF) to remain abreast of doctrinal and tactical trends amongst its allies. This paper, in support of the Commander RCAF's request for further analysis of the subject, will demonstrate that Canada requires a Precision Guided Munition (PGM) strike capability onboard high-endurance ISR platform(s).

In order to remain a capable, interoperable contributor within the future security environment, PGM strike capability must be integrated into existing and future ISR platforms. Canadian aerospace doctrine states that "Flexibility and versatility are key to the effective employment of aerospace power. …aerospace resources can be quickly and decisively shifted from one objective to another across a broad spectrum at the strategic, operational or tactical levels of conflict."[1] To demonstrate that an ISR Strike[2] capability is required for the RCAF to remain flexible, versatile and interoperable, this paper will review the doctrine of two major military allies of Canada, the United States and Australia. By comparing allied doctrine, strategy and tactics to those of the RCAF, it is clear that the employment of ISR platforms is not reaching

[1]Canada Department of National Defence, *B-GA-400-000/FP-000 Canadian Forces Aerospace Doctrine* (Trenton, ON: Canadian Forces Aerospace Warfare Center,[2010]).

[2] ISR Strike is not a term of common reference such as ISR Command (ISR-C). It is used throughout this paper to delineate the development/employment/consideration of utilizing ISR aircraft or platforms in the primary Canadian doctrinal roles of both Sense and Strike.

its full potential. Secondly, an examination of potential growth areas for ISR Strike within the context of both conventional and irregular warfare will clearly demonstrate the utility for PGM capabilities. The Future Operating Environment (FOE) is guaranteed to be uncertain, with existing counterinsurgency operations ongoing in Iraq, and the potential for aggressions by other states to create state-on-state or hybrid conflict like Ukraine looming on the horizon. Additionally, this paper will identify some generic capabilities that an ISR strike capability would require, from a broad capability perspective that includes both critical and enabling systems. Finally, an examination of potential platforms, including those in existence in the RCAF fleet and those that may be procured, will elucidate both the requirements and challenges from the viewpoint of arming another Canadian Armed Forces (CAF) aircraft. Development of additional offensive capabilities in the CAF and RCAF includes many stakeholders and must consider a broad range of impacts and inputs, including the culture and attitude of Canadians, the political will of the government, existing defense projects and timelines, as well as the perceptions and culture of CAF personnel.

DOCTRINE REVIEW

The intent of a doctrine review of allied of Australia and the Unites States will permit an objective review of the capabilities that our Five Eyes partners have determined to be the most effective overall use of airpower. Examination of their doctrine, platforms and tactics in the use of ISR Strike capability reveals by extrapolation an expectation that Canada, as a major allied partner, should be able to deploy with a similar set of robust, modern capabilities in future coalition operations.

> *The government believes that strike capability is an important element of Australia's military posture because it provides us with the flexibility to destroy*

> *hostile forces before they are launched towards Australia and when they are most vulnerable. Strike forces can provide excellent support to Australian forces deployed abroad, and may also offer a valuable option for contributing to regional coalitions.*
>
> *- Defence 2000: Our Future Defence Force*

Australia

Australia is an excellent start point for comparison to Canada, as while they are 1/3 less populous than Canada, they possess 40% more total military members, regular and reserve force combined.[3] Doctrinally, the Royal Australian Air Force (RAAF) segments offensive air actions into 2 categories, Strike and Offensive Air Support (OAS).[4] In this case, Strike represents penetrating, offensive action taken against the enemy in his own territory, often executed as an independent action without coordination with joint forces, designed to "weaken and enemy's capacity to fight…"[5]. This Strike definition aligns with the concept of Strategic Attack (SA), which is central to the origins of Air Power, and was codified in USAF Colonel John Wardens "Five Rings Theory" which will be discussed later in the paper.

The RAAF parallels other allied doctrine in the concept of OAS which, while vital to operational and tactical levels, is presumed to not always have an impact on the strategic end state of a conflict. It contains five sub-categories, three land-centric and two maritime-centric. They include: Close Air Support (CAS); Air Interdiction (AI); Forward Air Control (FAC); Surface Warfare (ASuW) and Under Sea Warfare (ASW), respectively. OAS is considered to be

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[3] Global Firepower, "Australia Military Strength," last accessed 28 April 2016, http://www.globalfirepower.com/country-military-strength-detail.asp?country_id=australia

[4] Australia, Royal Australian Air Force Aerospace Center, *Fundamentals of Australian Aerospace Power* (Fairbairn, RAAF Aerospace Center, 2002), 172,178.

[5] *Ibid., 172.*

air power in "…direct support to the surface forces…"[6] implying a requirement for coordination at operational and tactical levels. The RAAF AP-3C Orion is their primary manned ISR aircraft and is capable of delivery of multiple weapon types. "Wartime missions include locating and attacking enemy submarines and ships using torpedoes and Harpoon anti-shipping missiles."[7] The integration of the AGM-84 Harpoon with ISR demonstrates a sound endorsement of the air principals of reach, concentration of force and precision. However, the RAAF does not yet employ its AP-3C platforms in the overland precision strike role; it is limited to providing ISR effects only. Nevertheless, the AP-3C is being replaced by the P-8 Poseidon, which is capable of carrying a variety of weapons like land-attack PGM, including

> "…lightweight Raytheon Mk.54 anti-submarine torpedoes. It may also carry other torpedoes, missiles, free-fall bombs, depth charges, mines, or sonobuoys… Air-to-surface and air-to air missiles, such as Harpoon anti-ship missiles, SLAM or AGM-65 Maverick land attack missiles, and AIM-9 Sidewinders or AIM-120 AMRAAMs will be carried on the underwing hardpoints"[8]

The RAAF enhanced the versatility of high-endurance ISR platforms as multi-role aircraft, which enables rapid changes to mission sets depending on crewing and armament load out. With respect to the AP-3C "…multi-roling[9] enable(s) even relatively small deployed air components to create far greater effects than their mass would suggest, whether acting

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[6] *Ibid.*, 178.

[7] Royal Australian Air Force, "AP-3C Orion," accessed 26 April 2016. http://www.airforce.gov.au/Technology/Aircraft/AP-3C-Orion/?RAAF-//YPMc68jYhKbVgHtZ92chiR88FVCnyo

[8] Military Today, "Boeing P-8 Poseidon," accessed 26 April 2016 http://www.military-today.com/aircraft/boeing_p8_poseidon.htm

[9] RAAF doctrine differentiates multi-role and multi-mission aircraft, stating that multi-role air platforms require payload reconfiguration and crewing changes to perform different mission sets between sorties, while multi-mission platforms are crewed and configured to perform multiple mission sets in one sortie. High-endurance ISR platforms present an opportunity to build multi-mission aircraft, by exploiting the reach, persistence, payload, crew size, and sensor capacity that they possess.

independently of surface forces or in closely integrated operations."[10] Currently, Canada is able to deliver only ISR effects overland/ASuW role and weapon delivery in the ASW role, demonstrating a lack of versatility in a multi-role platform.

The Future Operating Concept for the RAAF identifies Precision as a vital characteristic of airstrike weapons, a common theme throughout all allied doctrine. Driving the requirement for precision is the political and social requirements for low collateral damage weapons. Specifically, "Precision weapons of smaller yield or non-lethal effect will allow force to be applied from the air in a greater variety of circumstances and with broader range of effects."[11] This identifies the requirement common to all Western forces; the lawful application of force must minimize collateral damage to the lowest level possible. Canada should embrace emerging trends in technology that enable the precise delivery of low-yield weapons, a must if future coalition operations.

United States of America

The United States Air Force (USAF) is the one of the largest in existence. By comparing Canadian doctrine with the US services, including the USAF, Army and Marines, it is not to suggest we must mirror their capabilities, as their military and population are orders of magnitude larger than that of Canada. However, as our closest military ally, it is prudent to examine their doctrine and capabilities to understand their expectations of coalition partners in a future fight. It is often said that Canada will never deploy forces unilaterally; however, the

[10] Commonwealth of Australia, *The Air Power Manual* (Tuggeranong: Air Power Development Center, 2007), 88.

[11] Commonwealth of Australia, *The Future Air and Space Operating Concept – AAP 1000-F* (Tuggeranong: Air Power Development Center, 2007), 43.

RCAF would be remiss to simply rest on its laurels and avoid advancing its own defense capabilities such as ISR Strike, by assuming the U.S. will provide it at any time.

USAF doctrine identifies the same roles for air forces, including AI, CAS and SA, but also places greater emphasis on air power in a counterinsurgency (COIN) environment. Aligned with Warden's Five Rings, USAF doctrine emphasizes SA as fundamental to coercion theory, centrally focused on leadership influence.

> "Decapitation threatens the enemy's military and national leadership… Power base erosion is tied to decapitation and involves threatening a regimes relationship with its supporters. SA can accomplish this with air strikes… SA seeks to achieve the greatest effect for the least cost of lives…"[12]

The ability to apply pressure against an enemy's Center of Gravity (COG) remains a fundamental principle of maneuver warfare, and RCAF ISR aircraft are frequently employed independently of ground forces, as seen in Op IMPACT in Iraq, making SA a suitable task, given the right conditions. Conversely, armed, high-endurance ISR aircraft should not be imagined as a panacea in SA, as employment in non-permissive or opposed environments would guarantee lost aircraft due to low survivability against current area access/area denial (A2/AD) weapons.[13]

It will be expected that the RCAF will contribute to a coalition's strategic and operational end-states in more ways than just the Sense function, when employing its ISR aircraft. Versatility of platforms is noteworthy in USAF ISR doctrine, stating that "missions for many Air Force assets have expanded beyond what was envisioned as the initial concept… to include a variety of

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[12] United States Air Force, *Strategic Attack: Air Force Doctrine document 2-1.2* (n.p., Air Force Doctrine Center, 2007), 32,6.

[13] Dr. Carlo Kopp, Air Power Australia, "UAVs versus manned LRMP platforms," accessed 01 Feb 2016 http://www.ausairpower.net/SP/DT-LRMP-vs-RPV-Dec-2010.pdf

innovative functions… …traditional ISR assets have become weapons platforms."[14] The RCAF must similarly embrace the full kinetic capacity of its current or future ISR platforms, either manned or unmanned, in order to remain a viable force. To remain stagnant in the face of air power's evolution is to guarantee the irrelevance of Canadian contributions to future coalitions.

The U.S. Army contends that in future conflicts, "…ISR must support lethal and non-lethal capabilities… (it) must play a role in ensuring that a weapon system's effects are brought to bear only against the intended target."[15] This re-emphasizes the precision requirement which is derived from the U.S. government concern over collateral damage. Canada is no different. During Op MOBILE in Libya, the coalition air component was restricted from delivering any munitions; precision guided or not, if there was even a remote chance of collateral damage as a result of the engagement. These policies confirm that the RCAF must ensure that it enables its ISR assets to deliver or enable precision kinetic effects. The Strike Coordination and Reconnaissance Coordinator (SCAR-C) role the Aurora filled in Libya was new and ad-hoc, and the author contends, an attempt at securing the future legitimacy of the CP-140 fleet. Then Captain Alan Lockerby, Tactical Air Control Party Officer, reports that the SCAR-C role was to role was to "…employ CP140 Aurora sensors to acquire and verbally indicate targets for multi-role fighter aircraft…"[16] This verbal handover requirement was due to two major impediments: a lack of laser designation/indicating capability, and poor Target Location Error (TLE) of their sensor's coordinates. This lack of capability led to extended sensor-to-shooter loops, and delayed

[14] United States Air Force, *Intelligence, Surveillance and Reconnaissance Operations: Air Force Doctrine document 29* (n.p., Air Force Doctrine Center, 2007), 46.

[15] United States Army, *The U.S. Army Concept Capability Plan for Intelligence, Surveillance, and Reconnaissance TRADOC PAM 525-7-9* (n.p., Army Capabilities Integration Center, 2008), 24.

[16] Alan Lockerby, "SCAR-C over Libya: To War in an Aurora," *Canadian Military Journal* 12, no. 3 (Summer 2012): 63.

the kill chain. While effective, the strikes would have been far more efficient and timely if the Aurora was equipped with its own PGM or some form of laser designation capability to guide other munitions or sensors.

Conversely, U.S. Navy P-3Cs are armed with a variety of PGM weapons, including the AGM-84 HARPOON …AGM-84K SLAM-ER and shorter range AGM-65 Maverick.[17] During Operation ODYSSEY DAWN in Libya, a "…P-3C fired at Vittoria (Libyan Coast Guard vessel) with AGM-65F Maverick missiles, rendering the 12-meter patrol vessel ineffective and forcing it to be beached…"[18] During Operation ALLIED FORCE in Kosovo, the P-3C launched SLAM-ER, providing the Joint Force Air Component Commander with "…the new flexibility to strike mobile targets at short notice"[19] from standoff distances. The RCAF has an opportunity to build upon its precision strike capability by employing high-endurance ISR platforms in a manner similar to that of the United States and Australia. A review of Canadian doctrine and policy will highlight ISR Strike is appropriate to our our military doctrine and culture.

Canada

RCAF doctrine is subdivided into five sections that align with CAF operational functions; Command, Sense, Shape, Shield and Sustain. ISR Strike bridges Sense and Shape by compressing the sensor-to-shooter loop without removing any of the necessary Command and Control inputs into the cycle. Shape doctrine states "A platform which is capable of both

[17] Military Today, "Lockheed P-3 Orion," accessed 28 April 2016 http://www.military-today.com/aircraft/lockheed_p3_orion.htm

[18] United States Navy, "US Navy P-3C, USAF A-10 and USS Barry Engage Libyan Vessels," accessed 11 April 2016 http://www.navy.mil/submit/display.asp?story_id=59406

[19] United States Secretary of Defence, *Report to Congress: Kosovo Operation Allied Force after-action report* (Washington, Department of Defence, 2000) , 93.

collecting information and acting upon it blurs the line between intelligence collection and operations, emphasizing the flexibility, versatility, and responsiveness of aerospace power."[20] As stated above, the CF-18 is the only platform in the RCAF with PGM capability. ISR Strike would complement the CF-18 strike capability by providing commanders with a high-endurance, multi-sensor platform capable of acting immediately in a variety of situations such as time sensitive targets. Otherwise, the commander is denied the ability to rapidly act on the intelligence that an ISR platform like the CP-140 provides. Delays in the kill chain due to re-tasking of strike aircraft to could result in lost opportunities to strike fleeting high value targets (HVT) such as insurgent leadership, or as seen in the first Gulf War, mobile SCUD launchers.

Projecting Power: Canada's Air Force 2035 states that the RCAF will be required to operate in non-traditional, unconventional and urban environments[21] It further expands on this premise

> "…the Air Force must be capable of decisively shaping the battlespace to permit maximum freedom of action to our forces while denying it to the adversary. Ever vigilant and ready to strike, the Air Force *will* shape the air environment while shielding and supporting forces operating in the land and sea environments."[22]

The key observation is the RCAF must be prepared for complex, non-linear, non-contiguous theatres that could involve hybrid warfare, near-peer, or counterinsurgency operations. Essentially, its guidance states to be ready for anything and everything. ISR Strike will contribute to being prepared for those eventualities by delivering not only the increasingly important role of ISR, but also "…relevant, responsive and effective airpower to meet the

[20] Canada Department of National Defence, B-GA-403/FP-001 Canadian Forces Aerospace Shape Doctrine (Trenton, Canadian Forces Aerospace Warfare Centre, 2014), 12.

[21] Department of National Defence, *Projecting Power: Canada's Air Force 2035* (Trenton, Canadian Forces Aerospace Warfare Center, 2009), 37.

[22] *Ibid.* 42.

defence challenges of today and into the future,"[23] to reference the RCAF mission statement. To understand where ISR Strike nests amongst doctrine, a review of Canadian Defence Strategy is also warranted.

The Canada First Defence Strategy (CFDS) was enacted by the previous Conservative government, and Liberal Prime Minister (PM) Trudeau has recently announced that the Minister should "Conduct an open and transparent review process to create a new defence strategy for Canada, replacing the now-outdated Canada First Defence Strategy."[24] [25] It is highly unlikely that the core defense missions of Canada will change, as outlined in a recent report on International Security and Defence Policy submitted as advice to the PM. Table 1 compares the International Security and Defence Policy document and the CFDS. Strategy is a derivative of policy, and it becomes clear that the more specific missions in CFDS are nested under the three core missions in the policy paper. Dr Joel Sokolsky, Professor of Political Science at RMC, notes that Canadian Defence policy, regardless of the majority party, will address four key areas:

> "…commitments to NATO (and other collective western efforts), NORAD (and co-operation with the US with regard to North American security), contributions to UN peacekeeping operations (however defined), and a role in the protection of national sovereignty along with support in a wide range of domestic activities."[26]

Table 1 - Comparison of CFDS to recent Defence Policy advisory document.

[23] Canada, Director General Air Force Development, *Air Force Vectors* (Ottawa, Department of National Defence, 2014), ix.

[24] Center for Institute and Policy Studies, *Canada's International Security and Defence Policy,* (Ottawa, University of Ottawa, 2015), 16. www.cips-cepi.ca/wp-content/uploads/2015/.../CIPS-Intl-securityEN.pdf

[25] Pending policy review the author feels it is most prudent to refer to CFDS as the most recent approved strategy on record in the analysis of ISR Strike capability.

[26] Joel Sokolsky and Joseph Jockel, *A Defence Reivew? Not Really Necessary:But if Canada Necessarily Must, Here Are Some Things to Keep in Mind and to Avoid* (Ottawa: CDA Institute, 2016), 2. http://www.cdainstitute.ca/images/Analysis/Sokolsky_Jockel_Analysis_April_2016.pdf

International Security and Defence Policy document[27]	**Canada First Defence Strategy**[28]
1. Defend Canada and Canadians	1. Conduct daily domestic and continental operations, including in the Arctic and through NORAD
2. Defend North America	2. Support a major international event in Canada, such as the 2010 Olympics;
3. Promote peace and security abroad	3. Respond to a major terrorist attack
	4. Support civilian authorities during a crisis in Canada such as a natural disaster;
	5. Lead and/or conduct a major international operation for an extended period;
	6. Deploy forces in response to crises elsewhere in the world for shorter periods.

Comparison of CFDS with recent policy advice paper, demonstrates an ongoing commitment to expeditionary capabilities for the CAF. The employment of ISR Strike in a domestic role would be *in-extremis* outside of the defence of Canada or North America. ISR Strike in an expeditionary role would be highly effective in both conventional warfare and irregular warfare.

Conversely, irrespective of utility or effectiveness, if the government does not value strike capability, it is unlikely to be procured. For example, the government's removal of the CF-

[27] Center for Institute and Policy Studies, *Canada's International Security and Defence Policy,* (Ottawa, University of Ottawa, 2015), 16. www.cips-cepi.ca/wp-content/uploads/2015/.../CIPS-Intl-securityEN.pdf

[28] Department of National Defence, *Canada First Defence Strategy* (Ottawa: Canada Communications Group, n.d.), 3.

18 detachment from Op IMPACT signals a desire to reduce kinetic action abroad, choosing instead to focus on contributing to peace and stability through foreign aid, 'advise and assist' missions using Special Forces (SOF) and the delivery of ISR with the CP-140 Aurora. The Aurora still provides targeting information that is used in kinetic strikes, but the removal of any Canadian assets that are delivering weapons reveals a policy culture at the political level that may be unsupportive of further PGM capability development. The versatility of ISR platforms with integrated PGM is undeniable; by having a platform that can contribute to all aspects of the Find, Fix, Strike, Finish and Analyze (F3EA) cycle, the RCAF will be well positioned to participate in any future conflict, be it conventional or irregular warfare.

> *An agile and integrated air force with the reach and power essential for CAF operations.*
>
> *-RCAF Vision Statement*

CONVENTIONAL AND IRREGULAR WARFARE

The requirement for ISR in military operations is constantly growing as technology permits gathering of information with greater fidelity, higher speed and transmits it great distances. A parallel increase in the capabilities of weapons is also occurring, allowing kinetic effect to be delivered from greater distance at with pinpoint accuracy. Regardless of its size relative the U.S., Canada must maximize its potential as a defence partner, specifically in expeditionary coalition operations, which are understood to be a certainty in the FOE. Shaun Clarke, Director of the RNZAF Air Power Development Center, states that with respect to small nations and strike capability, "…the main limitations are economically based. Small nation afflictions include low mass, low sustainability, limited technology, low tolerance for casualties

and a low capacity for platform attrition."[29] This list describes the RCAF to tee. Furthermore, he notes that small nations "must make do with what they can afford. The must play the hand they are dealt in the cleverest way possible."[30] For Canada to be a contributor to coalition operations, we must expand our platforms capabilities in both conventional and irregular warfare.

Conventional Warfare

The conventional battlespace has a broad spectrum of possible aggressors, from near-peer nations like China or Russia, to embattled nations like Syria. ISR Strike would be of use in any of these scenarios, if properly equipped. USAF Colonel John Warden's "Five Rings" theory represents a modern model of the application of air power and demonstrates the requirement for PGM onboard ISR platforms. Warden considered three missions for the delivery of kinetic air power, Strategic Attack (SA), Air Superiority (AS), Air interdiction (AI) and Close Air Support (CAS)[3132]. ISR Strike is capable of SA, CAS and AI, acknowledging that in a conventional battlespace with modern air-to-air and surface-to-air threats, large ISR aircraft will not survive. Air Superiority/Supremacy will be required for their employment. Warden's Five Rings are

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[29] Shaun Clarke, *Strategy, Air Strike and Small Nations* (Fairbairn, Air Power Studies Center, 1999), 68.

[30] *Ibid.* 70.

[31] John Andreas Olsen, *John Warden and the Renaissance of American Air Power,* (Washington D.C.: Potomac Books, 2007), 66.

[32] USAF Counterland doctrine defines Air Interdiction as air operations conducted to divert, disrupt, delay, or destroy the enemy's military surface capabilities before it can be brought to bear effectively against friendly forces, or to otherwise achieve objectives that are conducted at such distances from friendly forces that detailed integration of each air mission with the fire and movement of friendly
forces is not required. Airpower indirectly supports land forces and directly supports
JFC objectives in the absence of friendly land forces. Close Air Support (CAS) is defined as
air action by fixed- and rotary wing aircraft against hostile targets that are in close proximity to friendly forces and that require detailed integration of each air mission with the fire and movement of those forces. In contrast to AI, CAS directly supports land maneuver forces. Whether destroying enemy surface forces, interdicting supply routes, or providing CAS to friendly troops, counterland operations are a vital airpower function that applies throughout the range of military operations.

shown in Figure 1. The rings represent the adversary's multiple centers of gravity that require destruction or disruption to bring about strategic paralysis by "…changing the mind of the enemy leadership, directly or indirectly through the imposition of the necessary level of paralysis upon him."[33] The center of the ring represents the highest value targets, which have the greatest likelihood of achieving the required end state if targeted, either kinetically or non-kinetically.

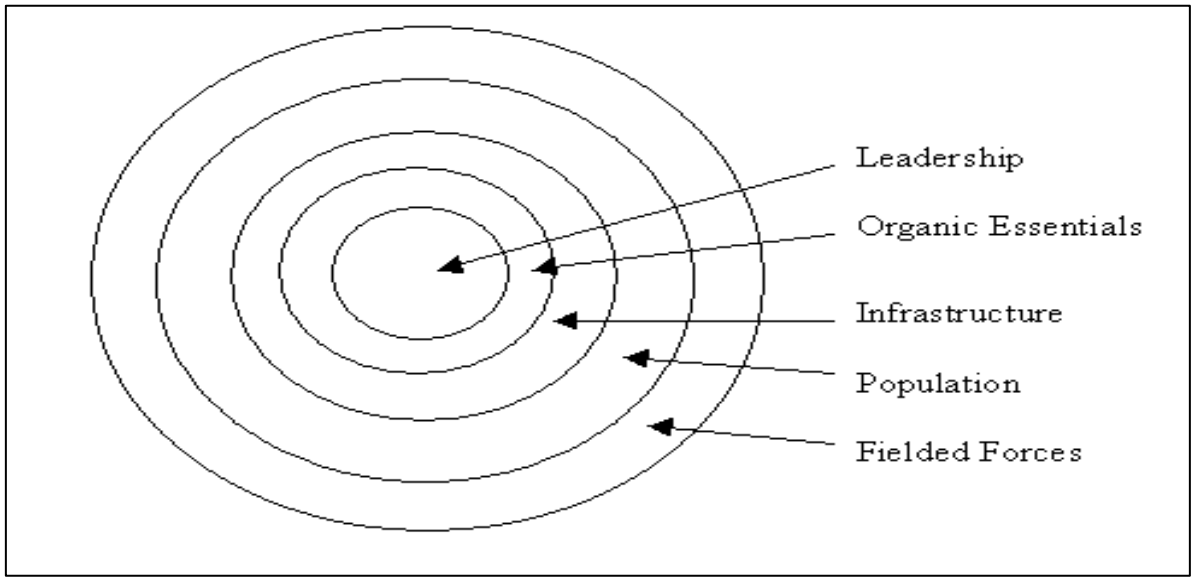

Figure 1. – Warden's Five Rings

Action and Learning: Source: Lutes, Al-Qaida in a Systems Approach

ISR Strike has the ability to deliver effects across the physical, psychological and moral planes by disrupting, destroying or delaying any of the components across the Five Rings. Examples of effective employment of ISR strike involve the U.S. P-3C strikes against vessels or land targets in Libya and Kosovo respectively. A further example is the use of air strikes against Taliban forces in the opening stages of Op ENDURING FREEDOM in Afghanistan. The

[33] David S. Fadok, *John Boyd and John Warden: Air Power's Quest for Strategic Paralysis* (Maxwell Air Force Base: Air University Press, 1995), 27.

precise, devastating firepower of the U.S strike aircraft caused a rapid, complete collapse of Taliban forces. (Fifth Ring). It was conducted in a semi-permissive environment due to the presence of anti-aircraft artillery (AAA) fire from the Taliban, which meets the requirement to employ armed ISR aircraft. The success of the strikes was critically dependent on the U.S. SOF forces deployed on the ground for targeting. In Gulf War 1, the air campaign struck parallel targets across the Five Rings to bring about strategic paralysis of the Iraqi regime. Figure 2 displays the target sets correlated with the Five Rings. It should be clear that ISR Strike could be well employed in this situation, but only once Air Superiority was established.

IRAQI TARGET SYSTEMS

Leadership	Key production	Infra-structure	Population	Fielded forces
Saddam Hussein's government	Electricity	Roads	Military elites	Strategic air defenses
National command and control	Retail petroleum		Foreign workers	Strategic offensive (air and missile)
Internal security forces	Weapons of mass destruction		Ba'athists	
			Middle class	

Figure 2 – First Gulf War Target Set across the Five Rings[34]

Source: Warden, Success in modern war: A response to Robert Pape's bombing to win

ISR platforms are capable of AI and CAS roles in these scenarios. They possess the ability to loiter for long periods of time, 10-12 hours for the CP-140, enabling immediate response to dynamic events; they have a comprehensive suite of sensors for ISR/targeting, enabling simultaneous employment of multiple sensors; they have robust crews with capacity for

[34] John A. Warden, "Success in modern war: A response to Robert Pape's bombing to win," *Security Studies* 7, no.2, (2007) 172-190.

embarking specialists such as SOF/FAC/INT/C2 elements, enabling real-time, first line assessment and decision-making. During Op MOBILE, 72% of Canadian strike missions in Op MOBILE were dynamic, while 28% of missions were deliberate in origin[35] indicating an opportunity for ISR platforms to integrate persistence with kinetic strike. While armed ISR aircraft would not be capable of penetrating strategic attack, they could provide strategic attack against key targets if equipped with PGM such as the AGM-84k SLAM-ER that is utilized on the U.S. P-3C and incoming P-8 fleet.

Counter to Warden, Robert Pape of the University of Chicago argued that the uses of punishment strategies for coercion through aerial bombardment are not effective. He notes that that historically, attacking production, infrastructure and population (Rings 2 through 4), will not cause internal revolt or collapse in a country.[36] Modern Western ideals and the Laws of Armed Conflict indeed prohibit the direct targeting of civilian populations and infrastructure, and second order effects of striking power grids or water supplies can have disastrous results for the population including disease and death, highlighting the requirement for oversight in employing ISR Strike. If these existing characteristics of ISR aircraft (reach, persistence, sensors, crew composition, and response time) are synchronized with the ability to deliver precision kinetic effects across the Five Rings, the RCAF will have a broad spectrum, force-multiplying platform, able to operate in not only conventional but irregular warfare operations as well.

Irregular Warfare

> *If we are in operations against a force like ISIS, the surveillance piece is important, but we also want to contribute to the strike. In my view, there's little*

[35] Richard O. Mayne, "The Canadian Experience: Operation Mobile," in *Precision and Purpose: Airpower in the Libyan Civil War*, ed. Karl P. Mueller (Santa Monica: RAND Corporation., 2015), 255.

[36] Robert Pape, "The limits of precision-guided air power," *Security Studies* 7, no.2 (1997) 98.

> *point in having a UAV (unmanned aerial vehicle) that can see a danger but can't strike it if it needs to."*
>
> - *General John Vance, Chief of Defense Staff, 08 Mar 2016*

The FOE is certain to include irregular warfare operations as well as conventional. They may take the form of counterinsurgency (COIN), stability operations, or counterterrorism.[37] A review of global state-of-affairs reveals the trends of destabilization, insurgency and terrorism, including Syria, Iraq, Libya, Nigeria, and Somalia. PGM use is required in irregular warfare, but the considerations for its application are much different than actions against a formed military adversary. Irregular warfare is conducted in support of a host nation, to promote peace and security abroad. These objectives tie directly into the aforementioned defence policy and strategy of the Canadian government and CAF. Most often military campaigns are part of a "…much larger strategic plan which includes economic and political programs designed to win over the population to the government's cause."[38] This complexity generates a heavy demand for ISR to ensure that strikes are directed against correct, legitimate targets with low-to-zero option for collateral damage. Linking the F3EA functions in a single platform by integrating PGM with a robust set of sensors provides COIN campaigns with options for both kinetic and non-kinetic effect. Moreover, it gives the government options when selecting air forces to deploy; choose one or two ISR aircraft and 85 people, or choose 6 fighters, 2 tankers and 200 people, and still lack persistent ISR capability.[39] Lt Gen David Deptula, Deputy Chief of Staff for USAF ISR,

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[37] United States Air Force, *USAF Irregular Warfare Strategy*, Washington D.C.: USAF Chief of Staff, 2013, 5.

[38] James S. Corum, "The Air Campaign of the Present and Future: Using Air Power Against Insurgents and Terrorists," ed. Allan D. English (Winnipeg: Center for Defence and Security Studies, 2005), 32.

[39] This estimate is a rough order of magnitude based upon recent deployment manning levels to Operation IMPACT in Iraq, using the CP-140 ISR detachment and CF-188 fighter detachment as examples.

states "We need to move forward and act upon the precept that in the future 'every shooter is a sensor and every sensor a shooter."[40] This reinforces Clarke's earlier arguments about being versatile in the use of air power, not dogmatic about the original purpose of the airframe.

However, the application of kinetic effects in a COIN environment requires a delicate balance. The host nation (HN) must be supported and bolstered less the supporting coalition be viewed to be enforcing national security on their behalf. USAF doctrine on Irregular Warfare states that if coalition

> "…forces conduct the strike, there may be the perception that the HN government is dependent for its survival on foreign forces. …these may have the indirect effect of delegitimizing the HN government in the public's perception. Nevertheless, strike operations have a place in COIN, since the ability to hold targets at risk throughout the AO helps the United States and HN set the tempo of operations and seize the initiative from insurgent forces. The precision and lethality of airpower often provide the most discriminating application of firepower to COIN forces."[41]

To compare ISR Strike requirements between conventional and irregular operations, we refer back to Warden's Five Rings. The application of Warden's Five Rings is more challenging in an irregular environment, as evidenced in the 2006 Israel-Lebanon war. While employing massed, persistent ISR (including armed, manned and unmanned) guaranteed the Israeli Air Force (IAF) a kill chain of approximately one minute[42] against Hezbollah's fielded forces (Fifth Ring); it did not guarantee Hezbollah's strategic paralysis. Attacking the centers of gravity across the other rings destroyed infrastructure and caused civilian casualties which drew international

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[40] David Deptula, "Air combat platforms and ISR," *Defense Today*(March 2009) accessed 16 April 2016 http://www.ausairpower.net/SP/DT-Deptula-March-2009.pdf

[41] United States Air Force, *USAF Irregular Warfare Strategy... 5*.

[42] Benjamin S. Lambeth, *Air Operations in Israel's War Against Hezbollah: Learning from Lebanon and getting it right in Gaz*a (Santa Monica: RAND Corporation, 2011), 34.

condemnation and calls for cessation of strikes from the international community.[43] In this case, air strikes caused a loss of legitimacy for the overall campaign. To Canadian possibilities for an ISR Strike capability, one must examine the existing inventory of platforms, and examine the successes of similar programs in our allies.

RCAF PLATFORMS

Two existing aircraft in the RCAF inventory could fill the void of ISR Strike, the CP-140 Aurora and the C-130J Hercules. A Public Works Request for Information about an unmanned aerial system for the JUSTAS ISR project describes the following requirements:

- Electro optic infrared (EO/IR) sensor
- Synthetic Aperture radar capable of mapping, imaging and ground movement tracking
- Signals Intelligence (SIGINT)
- Range of 1000nm with loiter time
- Interoperable with allies with respect to laser designation
- Secure communications suite
- Compatible with ROVER video datalink systems
- Carry and employ PGM[44]

At first glance the list describes a CP-140, less the laser designator, SIGINT and PGM capability, notwithstanding that the range of a CP-140 is greater, at 4000 nm. The debate of manned versus unmanned ISR systems is not the intent of this paper; however, one must recognize that if the government sees value in a SIGINT/Laser/PGM capability in an unmanned high-endurance ISR platform, then it must see a similar benefit from arming a faster, higher-endurance, multi-role

[43] BBC News, "Lebanon has been torn to shreds," accessed 09 February 2016, http://news.bbc.co.uk/2/hi/middle_east/5196800.stm

[44] Public Works and Government Services Canada, *JUSTAS Project – Request for Information*, 2012, 1-20. Accessed 14 April 2016. https://buyandsell.gc.ca/cds/public/2013/05/29/70985b60097ff266a8033a6aa2a7fd63/ABES.PROD.BK__BL.B293.E23008.EBSU000.PDF

platform that is capable of embarking a variety of specialists, and potentially, multiple types of PGM.

CP-140 Aurora

As a fleet, the CP-140 is well suited to fulfill the ISR Strike role. It is equipped for maritime and overland ISR, and its crews routinely exercise ASW weapon employment, making them suitable for PGM employment, given sufficient training and support from the FAC and fighter communities. It lacks several capabilities, specifically laser designation/indication, one or more PGM systems, and a key enabling system, SIGINT. SIGINT enables operators to determine the context of the sensor feeds, which is a critical enabler of SOF operations, especially during TST operations. Compare watching a movie without sound, to watching it with sound. Which leads to superior understanding of the situation?

Several factors make the CP-140 less suitable for PGM capability. Firstly, the final phase of upgrades, 'Block 4,' is will not be complete until 2021-22.[45] Weapons projects cannot be inserted into the Block program without dislocating upgrade efforts and incurring change fees to contracts. By 2021, the aircraft have approximately 9 years of service life left. With a fleet wide installation takes an estimated 3-5 years, the useful life of PGM on CP-140 would be limited. However, establishing ISR Strike as a capability in Canada would ensure continuity for the concept when establishing requirements for the replacement aircraft for the CP-140 in 2030. Secondly, hard point mounting options are problematic. In addition to a bomb-bay, the original CP-140 airframe was outfitted with 10 hardpoints under the wings and fuselage, (see Annex A) the RCAF initially removed the hardpoints but maintained the interface wiring. Recent structural

[45] Fil Bohac, *Aurora Incremental Modernization Project: Block IV Overview*. Ottawa: PMO Aurora, 2016

upgrades saw new wing and empennage structures installed and the removal of weapon interface wiring. It is undetermined if the hardpoints in storage will fit the new wings, and significant effort would be required to re-wire the mounting points for armament interface. Notwithstanding the engineering and test efforts required, the airframe is capable of carrying multiple PGMs, both externally using hardpoints as well as internally in the bomb-bay. Aft-eject PGM also exist that are able to be loaded from inside the fuselage and deployed from pressurized launchers, in the same manner that sonobuoys currently are.

C-130J Hercules

The C-130J fleet is one of the newest in the RCAF inventory, and represents a unique opportunity to employ a roll-on/roll-off mission specific capability. By leveraging the existing U.S. Marine Corps (USMC) KC-130J Harvest HAWK (HH) weapons kit, it is possible to outfit existing C-130Js with a robust strike package with limited ISR. The HH delivered high-endurance CAS and AI primarily for USMC forces in Afghanistan and was hugely successful, often requested by UK troops to provide overwatch and fires for their operations. It was regarded as

> "…a game changer due to its long loiter time, low collateral damage precision weapons, multiple radios for communications and talk ons and the number of crew members with [CAS and ISR] experience. …The HH completed 150 direct fire engagements with no reported civilian casualties or collateral damage"[46]

The system consists of an EO/IR turret, ROVER video data link, 4 x AGM-114 Hellfire missiles, and up to 10x internally stored and launched AGM-176 Griffin missiles or GBU-44 Viper Strike glide bombs, a roll-on fire control console, and associated wiring and systems hardware. Griffin

[46] United States, United States Marine Corps, *KC-130J Harvest HAWK Operations in Operation Enduring Freedom*, Washington D.C.: Marine Corps Center for Lessons Learned, 2012, 3.

and Viper Strike munitions are loaded manually by crew members into pressurized launch tubes in the same manner that CP-140 crews load sonobuoys. Equipping the C-130J fleet with an ISR Strike capability role would represent a paradigm shift for the fleet, which historically has been used for transport and SAR only.

Several roadblocks exist to integrating ISR Strike capabilities into the fleet. Firstly, the interim service support (ISS) is under contract to Lockheed Martin (LM), not the RCAF, and any design changes, like HH test/installation, would be performed on the timeline of LM, at cost to the government instead of using internal RCAF engineering test establishments.[47] Secondly, existing training and culture in the C-130J fleet could require significant shift to integrate both ISR and Strike capabilities into a transport fleet. Significant support from the ISR, FAC and fighter communities would also be required to bring a Canadian C-130J HH capability on line. Thirdly, while functional in a tactical CAS/AI role, the HH does not possess additional sensors, such as those listed in the JUSTAS RFI, to enable other ISR taskings at the operational or strategic level.

CHALLENGES

In developing offensive capability, the government will be required to confirm both its defense policy and strategy for the future. Their recent withdrawal of CF-18s from Op IMPACT indicates a preference to employ ‘soft-power’ internationally, where a PGM capability would be an unlikely ‘hard-power’ tool of such foreign policy. The views of Canadians form part of the government’s defense calculus in the pending Defense Review. U.S. drone strikes in Pakistan

[47] Maj Mike Tourond, Aircraft Engineering Officer – C-130J, email conversation with author, 04 February 2016.

have drawn significant criticism,[48] and potentially Canadians may see parallels between the two capabilities, however dissimilar they may be, and protest its development. In the RCAF, the acceptance by the fighter pilot community of the idea that other platforms may conduct strike operations will take some time to gain legitimacy. Presently, they hold the monopoly on PGM use in the RCAF, and in simple conversation seem unwilling to entertain or support the emergence of another precision strike platform. Fleet rivalries aside, both CP-140 and C-130J communities will require the assistance of the CF-18 community to establish the program in their schoolhouses and gain critical mass in the proficiencies required for ISR Strike.

CONCLUSION

The requirement for the development of an ISR Strike capability within the RCAF is needed. By examining the doctrine, strategy and tactics of the United States and Australia, we are able to determine that Canada is lagging behind in the development of precision strike capabilities for its ISR platforms. Significant advantages exist in using high-endurance ISR platforms for strike missions; their long loiter times, advanced sensor packages, robust crew structure, and ability to embark mission specialists are but a few advantages that can be leveraged to shorten the sensor-to-shooter loop. Canadian ISR aircraft have been moderately successful in overland roles in both Libya and Iraq, but that is mostly a testament to the resourcefulness and resilience of the crews and contributions of coalitions partners, not a reflection of the capacity of the hardware to perform in the role they have been assigned. ISR Strike capability would enable a multi-role expansion in mission sets to include CAS and AI while improving the ability to perform and SCAR-C. The capability would be employable in

[48] Scott Shane, "Drone Strikes Reveal Uncomfortable Truth: U.S. Is Often Unsure About Who Will Die," *New York Times*, 23 April 2015. Accessed 03 April 2016. http://www.nytimes.com/2015/04/24/world/asia/drone-strikes-reveal-uncomfortable-truth-us-is-often-unsure-about-who-will-die.html

both conventional and irregular warfare operations in both dynamic and deliberate applications. It must be recognized that ISR Strike will only be effective in permissive or semi-permissive environments without a credible air threat. Finally, a review of RCAF platforms highlights some of the existing capabilities and subsequent challenges inherent in developing an ISR Strike capability, including engineering and fiscal constraints as well as cultural considerations of not only ordinary Canadians, but those of CAF members as well. Nevertheless, ISR Strike has shown itself to be a force multiplier with our allies, and Canada must embrace innovation and evolve itself in order to remain a capable, credible contributor to future coalition operations.

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ANNEX A: PHOTOGRAPHIC EVIDENCE

Photo 1 - AGM-65 Maverick on U.S. Navy P-3C

Photo 2 – U.S. Navy P-3C with AGM-84 Harpoon and Mk-46 torpedoes.

Photo 3 – RCAF AESOp loading A-size sonobouoys for internal launch.

Photo 4 – USMC C-130J Harvest Hawk crew loading GBU-44 Viper Strike PGM.