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ISR: YOU NEED TO FIND IT TO HIT IT

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Exercise *Solo Flight*

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"When we first took to the air, it was not to attack – it was to gather. It was to find."

-Lieutenant General David Deptula, *ISR in the Information Age*

As Commander Royal Canadian Air Force (RCAF), Lieutenant General (LGen) Michael J. Hood remarked in the 2016 *Joint Air Power Competency Centre (JAPCC) Journal*, "targeting is about more than dropping bombs and not always about dropping bombs at all; it's a way to think about and focus on what is most important within an operational environment."[1] The concept of focusing on what is critical to advance a campaign or an institution towards its objectives and desired end state has parallels to command theory, operational level plans and spans across the spectrum of conflict while touching elements of all RCAF roles, functions and capabilities. Targeting and its associated focus requires vision, and this vision in terms of targeting, can be interpreted as both the capabilities of intelligence, surveillance and reconnaissance (ISR) platforms and development of future concepts to enable delivery of air power in the most effective way possible.

In *Projecting Power: Canada's Air Force 2035*, the future operating environment section predicts that the RCAF will remain a central player in all forms of warfare across the full spectrum of conflict. Moving forward to 2035 and beyond, to maintain its effectiveness and relevancy, the RCAF will require a balanced mixture of capabilities that will have new roles.

> The Air Force can expect an ever-increasing requirement to deliver precision effects (greater than it has in today's inventory) as well as a wider range of non-kinetic effects. For example, new and/or improved

[1] Michael J. Hood, "The Royal Canadian Air Force and NATO," interview by the Joint Air Power Competency Centre, *Transforming Joint Air Power: The Journal of the JAPCC* 23, 2016: 17, https://www.japcc.org/wp-content/uploads/JAPCC_Journal_Ed-23.pdf.

> capabilities (such as intelligence, strategic surveillance and strike, influence activities and advanced search and rescue) may all be needed to remain combat effective in the year 2035.[2]

When examining the RCAF's vision as "an agile and integrated air force with the reach and power essential for CAF operations,"[3] the advancement of ISR capabilities will be key in these pursuits. Advanced ISR capabilities (or platforms) provide agility from allowing multi-role platforms to be capable of synergizing effects, provide integration from being interoperable within the various services or coalition structures, and provide reach from their ability to provide strategic, operational and tactical effects over networks, time, and space. Advanced ISR is what allows command to focus planning and operations to enable the air power function of act by using combat effective, highly capable weapons and platforms to deliver air power. With these concepts in mind, this paper will argue that a fully integrated joint targeting capability from advanced ISR assets is critical to enable efficient use of air power and maximize operational effects of the RCAF well into the 21st century.

Over the next three sections, this paper will demonstrate that ISR is a central player in all aspects of the delivery of 21st century air power. The first section will establish the interdependency of ISR on Air Force doctrine and joint targeting methodology as a means to enable effective command decision making. The second section will touch upon the benefits and efficiencies that a robust and persistent ISR cell can have on an operation, thereby facilitating the correct mix of dynamic and deliberate targeting that will maximize the overall effects of an operation. Finally, the third section

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[2] Department of National Defence, D2-247/2009E-PDF, *Projecting Power: Canada's Air Force 2035* (Ottawa: DND Canada, 2016), 34.

[3] Department of National Defence, A-GA-007-000/AF-008, *Air Force Vectors* (Ottawa: DND Canada, 2014), 33, http://airforce.mil.ca/caf/dairsp/page-eng.asp?cid=41.

will discuss what ISR brings to the joint integrated targeting capability with a look to enhancing and fostering advanced synergies to enable a more collaborative and common picture for all elements of joint, coalition and alliance levels of command to maximize the chances of success in operations.

CENTRAL TO EVERYTHING: ISR IN DOCTRINE AND TARGETING

Given the recent increased focus on the RCAF targeting capability, and modern examples of coalition conflicts in Iraq/Syria, Libya and Afghanistan, ISR is critical to enable most aspects of Air Force doctrine and the joint targeting cycle to ensure successful, effective, efficient and safe munitions (and non-munitions) based operations. Quite simply, as legendary air power theorist John Warden remarked in 1990, "the key to air power is targeting and the key to targeting is intelligence."[4] As the current and future battlespace continues to revolve around counter insurgency (COIN) operations, and as an essential requirement for the safe and effective conduct of any military campaign over the full spectrum of operations, ISR is a critical capability for Air Forces and should be a focal point for all fleets to develop. This section will demonstrate that ISR is everywhere; in doctrine, in targeting and leads to overall campaign efficiency. In short, joint targeting is important and ISR is a central, critical player and capability in the execution of air power projection.

In "Making Revolutionary Change: Airpower in COIN Today," former United States Air Force (USAF) Deputy Judge Advocate General Major General (Maj Gen) Charles J. Dunlap Jr stated that "ISR developments have major implications for the way airpower is used in COIN . . . the concept of precision is more than the ability of the

[4] John Warden, quoted in John R. Glock, "The Evolution of Air Force Targeting," *Air & Space Power Journal* 26, no. 6 (November-December 2012): 146.

weapon to hit the right place; it is as much about knowing the right place to strike."[5] The key word in the above citation is "knowing", and when broken down to provide further context, "knowing" implies knowledge which comes long after the collection of raw data. ISR is the critical capability, through processing, exploitation and dissemination (PED) that turns collected data into information, which only then can be transformed into knowledge for Commanders to make truly informed decisions. As stated by first USAF Deputy Chief of Staff ISR, Lt Gen David Deptula in *ISR in the Informational Age*, "ISR is an operational function with the goal of providing accurate, relevant and timely intelligence to decision makers; it is the lifeblood of effective decision making."[6]

ISR, and its position as a critical enabler of effective decision making, is captured in *Canadian Armed Forces Air Doctrine* as it states that the "RCAF uses the six Air Force functions (command, sense, act, shield, sustain, and generate) as a broad means to develop and employ air power capabilities . . . as factors to consider when employing air power."[7] These six functions and their relationship to one another are depicted in Figure 1[8] and, although all functions are

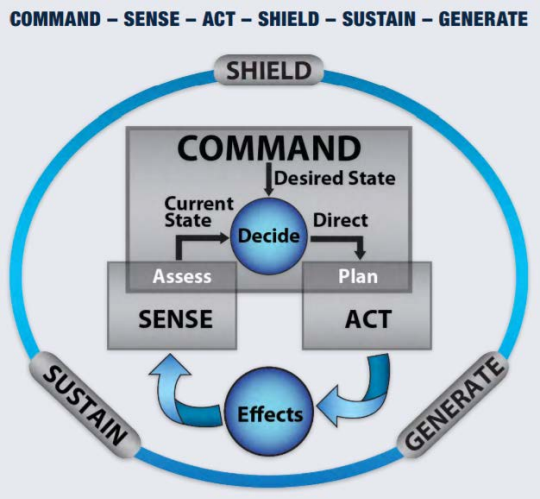

Figure 1 – RCAF Functions

[5] Charles J. Dunlap Jr., "Making Revolutionary Change: Airpower in COIN Today," *Parameters* 38, no. 2 (Summer, 2008): 57, http://search.proquest.com/docview/198078254/fulltextPDF/615135FC589D4CB1PQ/1?accountid=9867.

[6] David Deptula, "Intelligence, Surveillance, and Reconnaissance in the Information Age," *Leading Edge Airpower (*9 June 2015): 5, https://leadingedgeairpower.com/2015/06/09/intelligence-surveillance-and-reconnaissance-in-the-information-age/.

[7] Department of National Defence, B-GA-400-000/FP-001, *Canadian Armed Forces Air Doctrine* (Ottawa: DND Canada, 2016), 19.

[8] *Ibid.*

found within a loop leading to command and control (C2), it can be argued that the sense function is critical and central in enabling all of the others as it is the primary means to provide actionable information necessary for informed decision making by command. Similar to Maj Gen Dunlap's assertion that knowing the right place to strike is essential, sense, and by natural extension the core RCAF capability of ISR, is the critical capability that enables assessment for command and drives all other functions. ISR allows command to be able to decide and direct, which then allows planning to be completed using that intelligence data to enable the act function, and ultimately allow the effects to occur and then be sensed again to re-start the process. Essentially sense is critical to allow command to assess, decide, direct planning, enable act, process effects and allow the correct decisions and pathways for future command decisions to be refined and maximized for effects based operations.

With respect to RCAF functions and their relationship to capabilities, *Canadian Armed Forces Air Doctrine* states that the four core RCAF capabilities include control of the air, air attack, air mobility and ISR.[9] With further examination, it can be argued that all core roles and missions can be linked to ISR as all operations require command decisions which are informed by intelligence, notably from the capability of ISR. As described in *Canadian Armed Forces Air Doctrine;*

> ISR has come to mean more than its individual components of intelligence, surveillance and reconnaissance . . . ISR is the activity that synchronizes and integrates the planning and operation of all collection capabilities with exploitation and processing to disseminate the resulting information to the right person, at the right time, in the right format in direct support of current and future operations. ISR is a joint and, at times, multinational capability. RCAF ISR is part of multi-environment and multi-agency effort to gain situational awareness (SA) and subsequent decision superiority in support of Canada's national strategy. Therefore,

[9] Department of National Defence, *Canadian Armed Forces Air Doctrine*, 32.

> the RCAF conducts ISR not just in support of its own requirements but also those of the entire government.[10]

Fundamentally, ISR allows tactical through strategic levels to assess, which is not only critical to evaluate the end state and objectives but provides linkages to all other steps in order to prioritize, influence and drive all the current operations. ISR provides the means to Commanders to answer the questions "are we doing things right?" and "are we doing the right things?"

In order for ISR to provide the means for a Commander to answer the critical questions above and optimize the process to ensure efficient and effective execution of operations, joint targeting, as a methodology and cycle, provides the operational ways to plan for the ends required from the strategic level. As described by an RCAF targeting expert from the Canadian Forces Air Warfare Centre (CFAWC), Lieutenant Colonel (LCol) Jeff LeBouthillier, joint targeting is a method to analyze adversary capabilities, requirements and vulnerabilities with a goal to match appropriate munitions or non-munitions based effects to identify, vet and validate targets. It is an iterative process, not solely focused on dropping bombs, that enables Commander's to continually update and refine campaign (or operational) objectives and guidance. This process encompasses multiple levels and organizations across the spectrum of the Armed Forces and is "command led, plans directed, ops driven and coordinated but intelligence enabled."[11]

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[10] Department of National Defence, *Canadian Armed Forces Air Doctrine*, 36-37.

[11] Jeff Lebouthillier, "Joint Targeting Overview," transcript of a webinar lecture at CFAWC 19 May 2016, Air Warfare Education Branch, http://w08-ttn-vmweb01/cfawc/en/awe/webinars/joint-targeting-overview.asp.

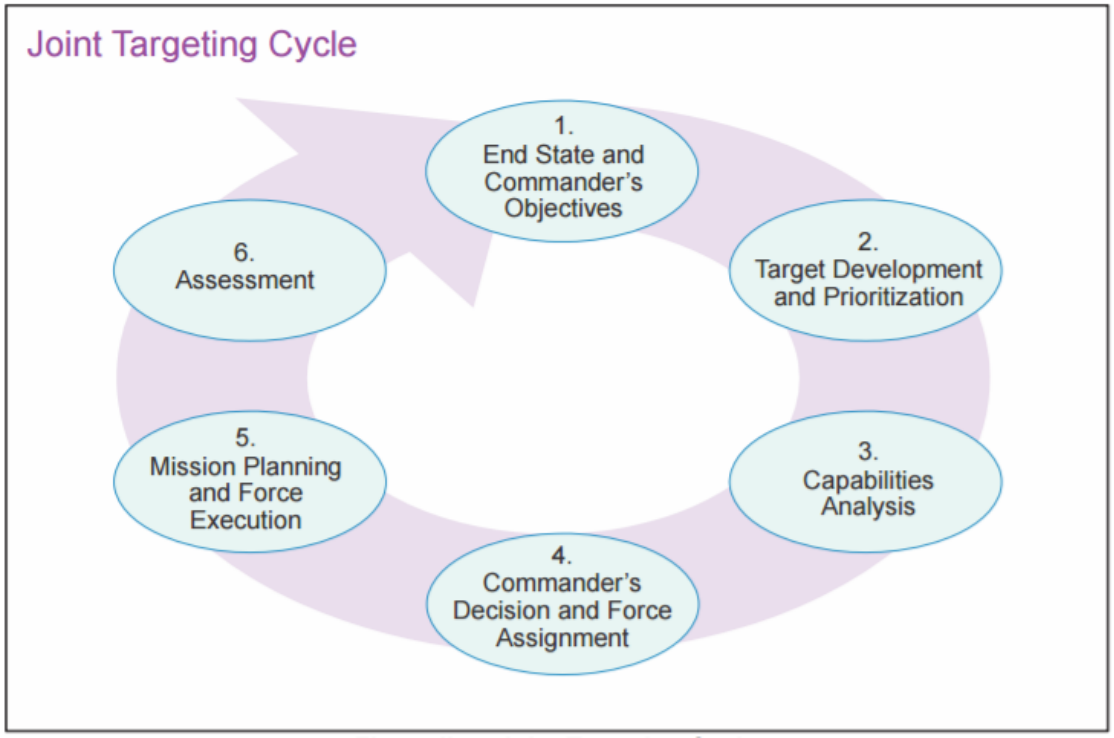

Figure 2 – Joint Targeting Cycle

When examining the circular process outlined in Figure 2[12], the overall joint targeting cycle can be simplified to the following steps:

1. inform Commander's objectives and desired effects;
2. select targets that when engaged achieve desired effects [value analysis];
3. select the best means to engage;
4. integrate all activities;
5. inform subordinate operations; and
6. assess the effectiveness.[13]

By examining Figure 2 and the preceding list of steps, it can be argued that ISR and its associated capabilities or analysis processes are central requirements to the efficient execution of the targeting cycle. ISR is a critical requirement, without which, the

[12] Joint Chiefs of Staff, *Joint Targeting*, JP 3-60, revision 31 January 2013 (Washington, D.C.: Joint Chiefs of Staff, 2013), II-4.
[13] Lebouthillier, "Joint Targeting Overview."

targeting process would grind to a halt, thereby requiring a greater acceptance of risk by command.

In order to inform a Commander, data must be turned into information and further analyzed to be subsequently transformed into knowledge so as to provide the best advice to enable his critical decision making process. ISR, and its associated PED functions, is the method of collecting and turning data into decisions. To make targeting decisions, targets must be developed, validated and vetted, which naturally requires intelligence to satisfy the operational requirements and contribute to the legal requirements for the target approval processes. At the same time, as part of deciding the best means to engage a target, intelligence products derived from ISR asset outputs are a critical piece in optimizing weapons. Integration of activities requires ISR as well since some targets require real-time ISR to execute pattern of life (POL) soaks to ascertain the lack of civilians or to map the patterns of life in the target area. With respect to informing subordinate operations or assessing effectiveness, ISR is a critical piece as once again, data must be transformed into information and knowledge to complete the cycle and restart the process. This analysis, assessment and reassessment cycle is essential for the Clausewitzian concept of selection and maintenance of aim, along with ensuring focus and convergence on the centre of gravity or end state. Quite simply, the entire process is dependent upon ISR as collection needs ISR, and with enough collection and processing, ISR will lead to effects. At the same time, the execution of effects needs ISR to enable pre- and post-targeting analysis, which will naturally lead back to, and drive, further development and collection priorities.

EFFICIENCY IN TARGETING

The overall concept of joint targeting, with targeting being a way to focus on what is most important within an operational environment, naturally leads to efficiency in operations and being able "to do more with less". In the current realm of resource constrained missions, support assets such as air-to-air refuelling (AAR) tankers, airborne early warning aircraft and suppression of enemy air defence (SEAD) aircraft are at a premium. Being able to "do more with less", meaning using less support assets and shorter fighter-bomber aircraft missions, is critical to not only minimize costs, but to reduce risks from longer missions with more aircraft over hostile territory. There is a current theme of using dynamic targeting missions as the main form of kinetic missions to compensate for a lack of deliberate target sets. This naturally requires longer duration missions for fighter aircraft to "find" targets and consequently, increases the associated support asset requirements. Being able to focus the joint targeting cycle, with a strong ISR cell, to develop more deliberate targets and thus shorten the burden on kinetic and support aircraft is key as we move to future conflicts. Having the joint targeting process, and its associated robust ISR capabilities across a multitude of platforms, enables the development of more targets. This makes more efficient use of all assets and enhances the Commander's ability to assess and direct planning necessary to reach a successful end state.[14]

In "To Bomb or Not to Bomb? Counterinsurgency, Airpower, and Dynamic Targeting," USAF Major (Maj) Jason Brown discusses the detractors and the merits of dynamic targeting in current COIN operations. Maj Brown points out that there are

[14] Based upon author's experience as Canadian Target Engagement Authority in AFCENT CAOC in Al Udeid, Qatar from April 2015 to October 2015 for Operation IMPACT.

generally two detractors in relying on dynamic targeting: collateral damage and the tendency to force attacks on targets of opportunity without considering the bigger picture. With respect to collateral damage, Brown contends that "historically, this type of targeting [dynamic] has generally been counterproductive in counterinsurgencies due to the real or perceived collateral damage."[15] In analyzing this statement, it can be deduced that this relates not only to damage to surrounding collateral concerns from an attack, but also to potential civilian casualties (CIVCAS) or damage to popular opinion from the local population that is being affected by the insurgency (although one could argue that the opinion of the population of the attacking COIN force is a significant player as well). In a more urban-oriented COIN campaign, POL assessment and target development is critical to minimize the risk of CIVCAS to its maximum extent. More robust ISR coverage to develop targets and have more detailed POL intelligence in a target area can pay dividends in the battle for public opinion and support at home and abroad. Tied to this theme is the overemphasis on dynamic targeting where the big screen, near real-time, play-by-play from ISR feeds can cause operational level Commanders to reach down with the tactical screwdriver, which can lead to "reinforcing the we must do something now mentality . . . [where the] reactive approach can quickly devolve into a game of whack a mole, which can cause commanders to . . . lost focus on the strategic end state."[16] This overall loss of focus can blur the benefits of spending extra time to use ISR assets to help develop more strategically or operationally important target sets. Deliberately slowing down the targeting cycle to develop, validate and assess the critical

[15] Jason M. Brown, "To Bomb or Not to Bomb?: Counterinsurgency, Airpower, and Dynamic Targeting," *Air & Space Power Journal*. Volume 21, Issue 4 (Winter 2007): 76, http://www.au.af.mil/au/afri/aspj/airchronicles/apj/apj07/win07/win07.pdf.

[16] *Ibid.*

nodes in an insurgent network can pay dividends by not only enabling the attack of more significant targets, but also by allowing more time to examine the impact of second and third order effects. Having awareness and understanding how operational and tactical level decisions are affecting the general population on both sides of the conflict is essential for all levels of government, as maintaining the will of all peoples against the insurgents is critical.[17]

On the other hand, Maj Brown counters that dynamic targeting does have some merits for the current battlespace as ISR and dynamic targeting can provide the real-time ability required to find the insurgents and take advantage of the somewhat fleeting opportunities for attack. The unpredictable nature of insurgents and their preponderance to hide within the general population allows coalitions to be able to take advantage of the high tempo dynamic targeting process and apply speed, lethality and precision to the insurgent problem. The operational flexibility that airpower can provide by being able to quickly detect, identify, target and engage enemy forces in a rapid fashion can provide significant advantages to the COIN force.[18]

This view of insurgent tactics is supported by doctrinal development agencies such as CFAWC who suggest that warfare will continue be waged by "irregular adversaries who are composed of poorly defined groups hidden among a larger population base."[19] Along with the irregular adversaries who use concealment within the general population, noted US defence research analyst Frank Hoffman states that the future conflicts will encompass hybrid wars, which cover "a full range of different modes of warfare including conventional capabilities, irregular tactics and formations, terrorist

[17] Brown, "To Bomb or Not to Bomb . . .," 76-80.
[18] *Ibid*., 78-80.
[19] Department of National Defence, *Projecting Power: Canada's Air Force 203*5, 32.

acts including indiscriminate violence and coercion, and criminal disorder."[20] Concealment, multi-modal warfare with irregular elements employing a wide range of tactics will make it more challenging for coalitions to monitor, track and develop targets in the traditional sense. Essentially, having persistent, covert, long endurance, multi-spectral sensor capable ISR coverage as armed unmanned aerial vehicles (UAVs) in the hunter-killer scenario[21] alone or by complementing orbiting fighter-bomber aircraft opens the ability to be patient and have over watch collection while taking advantage of tactical surprise to quickly attack targets of opportunity. The dispersed nature of poorly defined enemy groups requires patience and quickness at the same time; thus being able to listen, watch and attack at a moment's notice time is key. At the same time, waiting does not mean you sit on your hands, as you wait, watch and listen. ISR can be actively collecting data while simultaneously being passive in many different ways. It will be a key enabler to provide the required evidence to build the complex backstory required to validate and vet today's complex targets. Therefore, a preponderance of dynamic targeting missions can still be contributing to the deliberate target validation process. A healthy mixture of dynamic and deliberate missions will allow ISR and the integrated joint targeting process to help solve the complex targeting dilemma puzzle, thereby incorporating useful multitasking of "lull periods" while the blunt force of air power can be optimized and planned for to ensure success in years to come.

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[20] Frank G. Hoffman, *Conflict in the 21st Century: The Rise of Hybrid Wars* (Arlington, VA: Potomac Institute for Policy Studies, December 2007), 8, http://www.potomacinstitute.org/publications/Potomac_HybridWar_ 0108.pdf.

[21] Lance Menthe, Myron Hura, and Carl Rhodes. *The Effectiveness of Remotely Piloted Aircraft in a Permissive Hunter-Killer Scenario* (Santa Monica: RAND, 2014), http://www.rand.org/pubs/research_reports/RR276.html.

As an example of reliance on dynamic targeting resulting from the lack of ISR assets, we can examine Operation Unified Protector (OUP), the NATO campaign protecting Libyan civilians and rebels against Mu'ammar Gadhafi's Libyan military forces. In "The Air War in Libya," Division Operations Officer with the Defense Intelligence Agency, USAF Maj Jason Greenleaf, describes that in OUP the lack of ground forces resulted in an increased requirement for ISR and the coalition's limited ISR assets and resources resulted in an increased reliance on dynamic targeting.[22] The limited ISR naturally led to less (or minimal) target development for the coalition. This resulted in fewer deliberate targets and necessitated an increased reliance on generating SCAR or dynamic targeting sorties, which in turn can be assessed as an inefficient use of air power resources and a waste of effort that presented unnecessary risks to a multitude of platforms in the OUP mission.

The reliance on SCAR was a second order effect from the lack of ISR platforms as "the relatively few ISR assets, preplanned targets, and moral necessity of minimizing collateral damage meant that most attacks had to use dynamic targeting as well as [SCAR] tactics to seek out and destroy pro-Gadhafi forces."[23] Although the statement about collateral damage is slightly misleading and outside of the scope of this paper, the reliance on dynamic targeting and SCAR is valid. It can be argued that the reliance, and continuing reliance on dynamic targeting and SCAR is a less efficient manner of conducting an air campaign, especially with limited assets. Using basic math and tactical assumptions, SCAR missions require a three hour fighter vulnerability period (VUL),

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[22] Jason R. Greenleaf, "The Air War in Libya," *Air & Space Power Journal* 27, no. 2 (March 2013): 32, http://search.proquest.com/docview/1367982963?OpenUrlRefId=info:xri/sid:summon&accountid=9867.

[23] *Ibid*.

with approximately one hour of transit each way to and from the area, and thus a typical SCAR mission could be approximately five hours of flying. A deliberate Air Interdiction (AI) mission, on the other hand, would likely take two and a half hours maximum as the ingress, dropping of weapons and egress would likely take half an hour each as a conservative estimate. With a SCAR mission taking twice as long, it is evident that the AAR requirements will exponentially increase on this already limited resource. For fighter-bomber aircraft to be most effective with limited resources, it is best to have the majority of missions as AI style pre-planned deliberate strikes. In a deliberate strike, the target is previously vetted and validated and the strike package can take-off, rendezvous with the tanker, proceed to the marshal, push towards the target, drop their weapons and return home. This mission is of much shorter duration when compared to executing a mission looking for dynamic targets in a SCAR role as the aircraft can end up staying aloft over a much longer VUL and require multiple AAR brackets.

Overall, the debate of the merits of the current reliance on dynamic targeting can be circular and ultimately result in an “it depends” grey zone. What is critical is that whatever type of targeting scheme is executed, whether it be deliberate or dynamic, lethal or non-lethal, the consequences of the targeting need to be understood. This understanding comes from having sufficient ISR assets to allow the PED of collected data and the ability to apply the concepts of speed, lethality and precision to attack the insurgents as appropriate depending upon the tactical situation. As described in this section, there is a healthy balance and place for having a mix of deliberate and dynamic target missions to enable efficiencies on a multitude of levels and ensure continued

tactical gains, operational momentum is maintained and long term strategic goals are realized.

IMPORTANCE OF FULLY INTEGRATED JOINT ISR MOVING FORWARD

In order to be successful, multinational coalitions need to be able to share information and communicate with each other in many ways, shapes and forms. Similar to the desire to achieve edge organizations in command theory, coalitions need to embrace the elements of technology in order to share information in a rapid manner and inform decision makers in near real-time. This sharing of information and intelligence requirements is not a new concept and has been around for a long time, even back in the days of T.E. Lawrence, where he recognized the importance of intelligence in irregular warfare. When dealing with uncertainty in the battlespace, intelligence, and its associated capabilities, can turn unknowns into knowns and enable the full spectrum of options to deal with problems.[24]

As Lt Gen Deptula summarizes in *Intelligence, Surveillance and Reconnaissance in the Information Age*, the challenge of ISR today is to remove the stovepipes and take its wide range of capabilities to develop a coherent, rapid global response, with an easily shared collection and PED chain that enables near real-time sharing amongst services, nations and coalition partners. The inherent advance of a global network of ISR assets and PED capability can allow an increase flexibility and manpower advantage devoted to task without having to forward deploy a large number of personnel.[25] In today's

[24] T.E. Lawrence, *Seven Pillars of Wisdom* (Adelaide: University of Adelaide, 2005), Chapter XXXIII, https://ebooks.adelaide.edu.au/l/lawrence/te/seven/chapter33.html.

[25] Deptula, "Intelligence, Surveillance, and Reconnaissance in the Information Age," 1-4.

Information Age, Deptula states that;

> Precision has supplanted mass, timing has become compressed and service and coalition interaction has increased. Twenty-first-century demands require that what we once tolerated as separate tasks now become a single, integrated process. Battlespace awareness is the effect sought by security decision makers. Coordination and interoperability are no longer good enough.[26]

This view aligns with the current concept for the NATO Joint ISR initiative. Within the NATO context, it is viewed that the future of ISR and sensors needs to take advantage of modern technologies, recognizing that sensors of the future need to be viewed in a non-traditional sense. The sensors from a variety of different platforms need to be networked, and integrated in such a way that data can be pushed and pulled from a variety of different platforms to create joint C2 systems that interact with all levels from the strategic to the tactical.[27]

Lt Gen Deptula further suggests a possible way ahead for US and coalition ISR capabilities and relates to a move towards a "combat cloud". Lt Gen Deptula contends that a new alliance/coalition operational concept where the act, sense, sustain and command functions can achieve synergy in taking advantage of the cloud concept of shared, multi-access data that current smart phones operate on. This "resulting ISR, strike, maneuver, and sustainment complex could be described as a combat cloud that uses information age technologies to conduct highly interconnected, distributed operations."[28]

As for the way ahead for the RCAF, when interviewed for the 2016 edition of the *JAPCC Journal*, the Commander of the RCAF, LGen Hood, highlighted the importance

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[26] Deptula, "Intelligence, Surveillance, and Reconnaissance in the Information Age," 6.

[27] Matthew J. Martin, "Unifying Our Vision: Joint ISR Coordination and the NATO Joint ISR Initiative." *Joint Force Quarterly* 72 (1st Quarter 2014): 56-57.

[28] Deptula, "Intelligence, Surveillance, and Reconnaissance in the Information Age," 7.

of coalition integration and coordination in the ISR realm of operations and being able to have the compatible networks, software and kinetic capability to respond to future threats. LGen Hood is posturing the RCAF to gain and maintain a "fully integrated joint targeting capability with an end state of seamlessly contributing to future NATO or coalition targeting efforts."[29] The key piece of this statement is "seamlessly contributing", which means understanding the current fiscal restraints and recognizing the impossibility of a nation like Canada to be able to acquire the full spectrum of ISR assets, platforms and capabilities required to do it all. LGen Hood sees the RCAF "working with allied air forces to create an ISR system-of-systems network to blend the input from space-based assets, aviation resources, traditional sensor, and ground-based sensors."[30]

The requirement for a robust ISR system is echoed by Gen Gorenc who, in the 2016 edition of the *JAPCC Journal*, professed that a critical requirement for Joint Force Commanders to possess is persistent ISR, not only assets but a robust PED capability to transform data into information and knowledge and enable informed decision making for Commanders at all levels. Gen Gorenc states;

> Amateurs concentrate only on ISR collection; professionals concentrate on PED and fusion to make sense of data. With NATO AWACS and Alliance Ground Surveillance, NATO is getting better at ISR collection; however NATO PED requires more consistent national ISR contributions and improved fusion of all-source intelligence.[31]

Current and future conflicts have entered the realm where precision munitions are essential for success. ISR is a critical enabler for target development to allow the

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[29] Hood, "The Royal Canadian Air Force and NATO," 17.
[30] *Ibid*., 21.
[31] Frank Gorenc, "NATO Air Power – The Last Word," interview by the Joint Air Power Competency Centre. *Transforming Joint Air Power: The Journal of the JAPCC* 23, 2016: 9, https://www.japcc.org/wp-content/uploads/JAPCC_Journal_Ed-23.pdf.

precision munitions to achieve their desired effects. The ability to share raw ISR data and draw from individual components in near real-time with minimal firewalls can synchronize and integrate effects where "more precise, kinetic effects require more precise and sustained ISR."[32] Gen Gorenc further points out that ISR and PED advancement will not only be critical for the tactical execution phase, but critical to allow operational indicators and warnings to compensate for the lack of traditional strategic warning in the emerging battlespace due to non-state adversaries and threats. In concert with the assessment of LGen Hood on the importance of compatibility of ISR data, Gen Gorenc supports the view that an essential aspect of the future concept of ISR involves integrating alliance capabilities and making sure the development of emerging capabilities is done to complement and enhance the coalition or alliance as a whole.[33]

The critiques of NATO ISR capabilities have not fallen on deaf ears. In the *Joint Forces Quarterly 72*, USAF Lt Col Matthew J. Martin, former Chief of Allied Airborne Reconnaissance and Electronic Warfare with NATO Air Command, points out that the NATO Joint ISR Initiative is taking aim at the problem. Lt Col Martin noted that an April 2012 letter from the representatives of Multi-intelligence All-Source Joint ISR Interoperability Coalition nations ascertained that the recent operations in Afghanistan and Libya identified a scarcity of JISR assets, intelligence sharing shortfalls and a lack of dynamic targeting expertise. These shortfalls resulted in a proposal for a "Smart Defense Initiative" with would serve to rectify NATO's JISR deficiencies.[34]

To truly move forward with ISR capabilities and fully exploit modern technologies and information age advances, Lt Gen Deptula points out a critical issue to

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[32] Gorenc, "NATO Air Power – The Last Word," 9.
[33] *Ibid*., 11.
[34] Martin, "Unifying Our Vision: Joint ISR Coordination and the NATO Joint ISR Initiative," 55.

be resolved, which relates to the politics of procurement and budget limitations. ISR needs to be viewed in a bigger picture as a function comprising various aspects that no single platform or lump sum of money can improve by itself. Improving ISR requires a capabilities or effects based approach that looks at the entire spectrum of the kill chain and operational functions. ISR is not a supporting function of operations or a single platform as it is part of all aspects in operations. Synthesis of existing sensors, existing capabilities from a variety of platforms, new sensor technologies and advances in information sharing are one of the ways ahead to enable the concept of maximization of resources and information passage to enable informed decision making in near real time.[35]

In a subsequent *Air & Space Power Journal* article named "A New Era for Command and Control of Aerospace Operations", Lt Gen Deptula further expanded on the concepts described above and commented that the future of ISR, as a means to enable and enhance C2, involves joint-mindedness and integration to remove the silos of excellence that restrict military operations at times. A new way of thinking is required in order to take advantage of platforms and existing capabilities that are not involved in "traditional" ISR roles. This will help pave the way for future success as "innovative technologies, which enable new capabilities, will require novel ways to C2 as a means of optimizing the production of desired effects. We need to think beyond the constraints that traditional culture imposes on new technology."[36]

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[35] Deptula, "Intelligence, Surveillance, and Reconnaissance in the Information Age," 7-9.

[36] David Deptula, "A New Era for Command and Control of Aerospace Operations." *Air & Space Power Journal*, Volume 28, Issue 4 (July-August 2014): 7-8, http://www.au.af.mil/au/afri/aspj/digital/pdf/issues/2014/ASPJ-Jul-Aug-2014.pdf.

The aspects of joint integration to enable C2 and passage of information amongst services are well described already. It is the integration piece that can take ISR to the next level. Leveraging advances in technology and integrating them into existing and new platforms will allow for the development of advanced joint operational concepts and bring about a networked sensor/shooter capability as "[m]ost combat aircraft in the U.S. military have some type of sensor on board, yet virtually all of that potential ISR data is figuratively left on the floor of the cockpit."[37]. For example, Lt Gen Deptula points out that the fifth generation fighters such as the F-35 or the F-22 are no longer just fighters. The advanced technologies and sensor fusion from the onboard sensors results in the aircraft being a hybrid of all different aircraft where "they are flying sensor strikers that will allow us to conduct information-age warfare [and] . . . exploit non-traditional capabilities in a fashion that becomes the new traditional."[38]Notwithstanding the many visions of the way ahead for joint targeting, the key point overall to draw from this all is that there is a consensus amongst General Officers from different nations and within the NATO Alliance that joint targeting, and specifically the integration and sharing of information, is paramount today and in the future battlespace. The ability to communicate effectively in a clear and concise manner, while sharing information in near real-time will require all nations to embrace the development of advanced ISR platforms and technology to inform decision makers in the most effective way possible. How each nation moves forward may be affected by internal politics, budgetary constraints and bureaucracy but what is critical is that each nation use existing open communication channels to ensure that the development and enhancement of this capability is not done

[37] Deptula, "Intelligence, Surveillance, and Reconnaissance in the Information Age," 8.
[38] Deptula, "A New Era for Command and Control of Aerospace Operations," 7-8.

within international stovepipes. Using technological advances to further our collective defence capability, in an integrated fashion, via advanced ISR technologies is the way to maximize the chance of success.

CONCLUSION

No matter what a person's perspective is as to how the most efficient or effective way to conduct offensive air power operations is, it has been demonstrated in this paper that ISR is a critical enabler in achieving the overall objectives of a campaign. When examining doctrine, joint targeting methodology, efficiency in the delivery of air power or hypothesizing how the joint integration of ISR will play out, the key point is that doctrine and the joint targeting cycle is reliant upon ISR to ensure Commanders can be given the opportunity to make decisions with the greatest chances of success.

Quite simply, delivery of 21st century air power relies on much more than the kinetic effects from a bomb. The joint targeting cycle and ISR is a significant contributor to that end. As with the title of this paper, *You Need to Find It to Hit It*, finding to enable the hitting involves all the elements of Air Force functions to work in concert and there is a true interdependency of ISR on Air Force doctrine and joint targeting methodology. A robust and persistent ISR cell can improve the overall effectiveness of a campaign and bring about critical efficiencies and less reliance on critical support assets for an operation. The correct mix of dynamic and deliberate targeting and a joint integrated targeting capability will foster advanced synergies to enable a more collaborative and common picture for all elements of joint, coalition and alliance levels of command.

In the current battlespace and the predicted conflicts of the future, ISR will continue to be a critical capability. The associated procurement of advanced vehicle and

sensor technologies will be essential to further maximize the potential of ISR to influence the battlespace. Persistent ISR coverage incorporating advanced sensor technologies will maximize the ability to detect, deter, identify, target and assess the enemy while ensuring safe, efficient and effective targeting to achieve objectives and enable coalitions to realize their end states. A fully integrated joint targeting capability from advanced ISR assets is critical to enable efficient use of air power and maximize operational effects of the RCAF well into the 21st century. Taking advantage of technological advances and enabling network centric style warfare where data or information is integrated and shared in near-real-time amongst all members of the coalition or alliance. Advanced ISR capabilities will provide agility, integration and far reaching synergizing effects. Enabling strategic, operational and tactical effects over networks, time, and space, advanced ISR is the key piece that allows command to focus air power to deliver air power.

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