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HOW THE F-35 WILL IMPACT THE CF OPERATIONAL LEVEL

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Exercise Solo Flight

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“With revolutionary advancements such as reduction of radar and infrared visibility and supersonic cruise capability, fifth-generation combat aircraft will provide an impressive boost to any nation’s air force.”¹

INTRODUCTION

Canadian Forces air force fleets have changed significantly over the last hundred years. With this evolution in technology the methods of applying air power to the battle field have also evolved to best exploit the advantage these new technologies bring to operations. In the First World War, aircraft were used to observe the battlefield and drop bombs in direct support of Army operations.² After these initial forays into using aircraft for military purposes, new methodologies for employing aircraft and improved weaponry were created by air forces. Prior to the Second World War there was a school of thought created by Douhet that the aircraft alone could win wars by targeting vital centers.³ These aspects were disproven throughout World War II and in the years and campaigns that follow. Aerospace technology continues to evolve and be incorporated into the warfighting capabilities of nations. As these technologies are incorporated ever military will have a different approach to manage the changes. With the advent of fifth generation aircraft and the extensive suite of capabilities that it has, these discussions regarding employment of the aircraft will be important to shape its incorporation in to the RCAF.

All environments of the Canadian Armed Forces must have an understanding of this new

¹ Edward Hunt, "Analysis: Expectations for Deployment of Fifth-Generation Fighters," <http://www.janes.com/article/43616/analysis-expectations-for-deployment-of-fifth-generation-fighters>, (accessed 05/10, 2015).

² English, Allan and Colonel John Westrop, *Canadian Air Force Leadership and Command: The Human Dimension of Expeditionary Air Force Operations* (Trenton, ON: Canadian Forces Air Warfare Center, 2007), 6.

³ Canada. Department of National Defence. B-GJ-005-000/FP-001, *Canadian Forces Joint Publication: CFJP 01 Canadian Military Doctrine* Ottawa: Joint Doctrine Branch, 2009), 2-10.

technology to ensure its best use at the operational level. As the fighter aircraft capability advances from a fourth generation to the next generation of aircraft, there will undoubtedly be impacts on the use of these assets at the operational level. The key to the success in using any new technology for military purposes is ensuring a well-considered joint approach to the doctrine and policies surrounding its use. The acquisition of a fifth generation fighter aircraft will impact Canadian Forces application of doctrine at the operational level. This paper will outline current Canadian doctrine, what prompts evolution and change in doctrine, the advances in technology brought forward by the F35 platform, and finally how the introduction of the F35 will impact the Canadian Armed Forces (CAF) at the operational level.

DOCTRINE AND POLICY

Canadian military doctrine is derived to be compatible with the doctrine of Canada's allies and consistent with national policy.⁴ Prior to approaching how the incorporation of new technology in the RCAF will impact the operational level, current Canadian policy and doctrine will be reviewed to ensure a clear understanding of the factors that will be discussed in the latter part of this essay.

Canadian Defence Policy

The current strategic direction is provided to the Canadian Military through direction from the Canadian government contained in the Canada First Defence Strategy (CFDS). This direction was last updated in 2008; however the government has remained

⁴ Canada. Department of National Defence. A-GJ-025-0A1/FP-001, *Canadian Forces Joint Publication: CFJP A1 Doctrine Development Manual* (Ottawa: Joint Doctrine Branch, 2010)., 1-2.

consistent in its approach to defence during this time. This document is also used to express the government's overall vision for what type of military Canada will have and how this will be maintained. The overarching objectives of having a modern military with well-defined missions, predictable funding, the right equipment and training, and a partnership with Canadian industry are emphasized throughout the strategy document.⁵ The CFDS outlines missions that the CF must have the capacity to conduct, which include the continental operations in the Arctic through NORAD, response to a major terrorist attack, as well as leading or conducting international operations. This current strategy indicates that "to carry out these missions, the Canadian Forces will need to be a fully integrated, flexible, multi-role and combat-capable military."⁶ Within the CFDS there is also considerable emphasis placed on the ability to work with Canada's allies for overseas missions as well as an acknowledgement that this will require Canada to stay at a high level of combat and equipment capability with the United States. There is an emphasis on securing Canada, or which a critical part is being capable of conducting surveillance of territory, as well as maritime and air approaches.⁷ Defence of North America and partnership with the US is also of critical importance as shown by the statement that "To remain interoperable, we must ensure that key aspects of our equipment and doctrine are compatible."⁸ This guidance plays a significant role in the forecast for Force Development within the CF and for driving any other types of doctrinal change.

⁵ Canada. Department of National Defence, *Canada First Defence Strategy* (2008), 3.

⁶ *Ibid.*, 3.

⁷ *Ibid.*, 9.

⁸ *Ibid.*, 8.

The policy outlined by the CFDS forms part of the guidance that is used to determine the RCAF Force Development activities. Force Development includes training, equipment, and doctrine that are in line with the RCAF Campaign Plan.⁹ The Air Force Vectors publication outlines the RCAF commander's strategic vision as informed by the CFDS, Chief of the Defence Staff (CDS) guidance, the security environment, and DND priorities and DND corporate guidance. All of this guidance is combined into the RCAF commander's guidance "to position the RCAF to generate the airpower and airpower expertise required by the CAF to meet these challenges."¹⁰ The Air Force Vectors document serves to outline the elements in the four different Vectors (Agile, Integrated, Reach and Power) that require specific attention to ensure that the strategic vision will be realized. Among the objectives within this document, there are three that are relevant to the acquisition of the F-35. The first of these objectives is to be integrated within the Air Force, other environments within the CAF, and allies with the desired goal to be improved support to operations.¹¹ Secondly to engage with other airpower practitioners including allied nations military forces to support the CAF Global Engagement Strategy, which exploits existing resources in opportunities for global operations.¹² The third objective relevant to this paper is to enhance reach to ensure that commitments to NORAD are met, and to improve ISR within the domestic area of operational responsibility.¹³ *Air Force Vectors* provides a comprehensive outline of the

⁹ Canada. Department of National Defence. A-AG-007-000/AG-008, *Air Force Vectors*, 1st ed. Ottawa: Chief of the Air Force Staff, 2014), 2.

¹⁰ *Ibid.*, 2.

¹¹ *Ibid.*, 37.

¹² *Ibid.*, 38.

¹³ *Ibid.*, 40.

objectives that Force Development can work towards as well as a foundation for RCAF doctrine.

RCAF Doctrine

In 2006, the previous Canadian Air Force Doctrine, *Out of the Sun*, was replaced with the current doctrine. The biggest changes resulted in the doctrine becoming aligned with Canadian army doctrine and USAF doctrine in terms of the language and concepts used to describe aspects of aerospace power. Doctrine is defined as the “fundamental principles by which military forces guide their actions in support of objectives.”¹⁴ The realization that air force capabilities need to be explained in a way that the other forces can comprehend and relate in to their own understanding of the capabilities available in the operations the CAF participates in. The current air force doctrine has been aligned with the doctrine and terminology used by Chief of Force Development to ensure better alignment and understanding with the other forces within the CAF.¹⁵ The majority of RCAF doctrine has its roots in the USAF or NATO doctrine to further the common understanding with the CAF’s most consistent allies.

Within the current doctrine the characteristics of Aerospace Power as well as the functions and tenets of its use are articulated. Outlines eleven characteristics¹⁶ of aerospace power precision, sensitivity to technology, stealth, and support dependency are the characteristics that are associated with the CAF upgrading to the F35. Precision is

¹⁴ Canada. Department of National Defence. B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine* (Ottawa:Chief of the Air Staff, 2010).

¹⁵ *Ibid.*, ii.

¹⁶ *Ibid.*, 25.

focused on reduction of collateral damage through use of precision munitions.¹⁷ Sensitivity to technology means that innovations can impact the effectiveness of aerospace power, which leads to a continuing requirement for continuous improvement and ability to keep up with technology. Stealth speaks to the ability of the aircraft to be employed without being detected and maintaining the element of surprise. Tenets of Aerospace power are the guiding principles or truths that are used to conduct aerospace activities.¹⁸ These tenets include centralized control and decentralized execution, which allows for a commander to determine where his aircraft will be employed and allows the tactical commanders to execute tasks. Synergistic effects are the ability to coordinate aerospace power with other forms of national power to achieve an effect greater than either could alone.¹⁹ There are six functions of aerospace power described, but only two will be described at this time as they are likely to be impacted by the introduction of the F-35. These functions are the sense and act function. Doctrine outlines the guiding principles for employing aerospace assets and should be considered when incorporating a new fleet.

Joint doctrine

Canada's Joint doctrine is designed to provide guidance for the conduct of operations at the operational level for all environments and commands. Joint operations are those activities where more than one environment is involved. This doctrine essentially outlines the CAF Operational level doctrine. Not all nations have Operational level doctrine, which "encompasses the integration of theatre-wide assets in order to

¹⁷ *Ibid.*, 25.

¹⁸ *Ibid.*, 27.

¹⁹ *Ibid.*, 28.

facilitate the coordination and synchronization of multiple units in pursuit of a common goal.”²⁰ Canada’s Joint doctrine identifies the Air Component’s primary role as gaining and maintaining control of the air to allow the further projection of military forces into the Area of Operations.²¹ The document continues later to describe the commander AIRCOM, Commander RCAF, as the source of expertise on employment of air power.²² All elements of the Canadian forces need to be equipped to be able to conduct mission in support of allied and coalition operations as a single environment as well as operate in a joint Canadian context.²³ The CF Joint doctrine describes the relationships between the environments as well as the organization and structure associated with common joint mission types, whereas the RCAF doctrine outlines the characteristics and methods of employment for air assets. In this way joint and RCAF doctrine complement each other.

WHY DOES DOCTRINE CHANGE?

When answering the question whether the F35 by itself will bring about the requirement for new or updated doctrine, it is important to recognize the reason that doctrine exists. The RCAF Aerospace doctrine describes doctrine as the fundamental principles used to guide actions of military forces, but emphasizes that it is not rigid and may change based on information gained from experience.²⁴ One way to think about doctrinal change stems from the sentiment that “doctrine is about effects not platforms.”²⁵ USAF Air doctrine further outlines that theory, experience, and technology are three variables that affect

²⁰ Aaron P. Jackson, *Doctrine, Strategy and Military Culture: Military-Strategic Doctrine Development in Australia, Canada and New Zealand, 1987–2007* (Ottawa: Department of National Defence, 2013), 185.

²¹ Canada. Department of National Defence. B-GJ-005-000/FP-001, *Canadian Forces Joint Publication: CFJP 01 Canadian Military Doctrine* (Ottawa: Joint Doctrine Branch, 2009), 1-5.

²² *Ibid.*, 5-10.

²³ *Ibid.*, 6-2.

²⁴ *Ibid.*, 1.

²⁵ United States. United States Air Force, *Air Force Doctrine Document*, Vol. 1, 2015), 14.

doctrine.²⁶ Throughout the RCAF doctrine it is emphasized that doctrine is an evolution of the best ways of doing business and should be adapted when there is good reason to do so. New technology that can advance theory is new technology available within the world; however there is not always a cause effect relationship between technology and strategy.²⁷ Sometimes one eclipses the other because of not realizing full potential of technology or the strategy drives the development of the technology. Another reason that doctrine can change is based on experience. The Canadian Forces have a lessons learned system that captures any changes in doctrine or tactics that are discovered during operations or training. These lessons can later be translated into a change in doctrine.²⁸

If the effects that the F35 provides is a significant change over the effects provided by current air force fleets, or if there is a significant change in theory, experience or technology then it likely requires a change to doctrine.

FIFTH GENERATION FIGHTER TECHNOLOGY

The Canadian Government announced in 2010 that the replacement aircraft for the current CF-18/A will be the Joint Strike Fighter, F-35. There has been much debate whether a fifth generation aircraft is required by Canada, or whether a generation 4 or 4+ fighter would meet our defence needs.²⁹ A large part of the argument for staying with a 4th generation fighter is that it has proven to be sufficient in the past and that there will not be a requirement for anything more advanced or expensive. Since part of this

²⁶ *Ibid.*, 17.

²⁷ Xu Jin, "The Strategic Implications of Changes in Military Technology," *The Chinese Journal of International Politics* 1, no. 2 (December 21, 2006), 163.

²⁸ Canada. Department of National Defence. A-GJ-025-0A1/FP-001, *Canadian Forces Joint Publication: CFJP A1 Doctrine Development Manual* (Ottawa: Joint Doctrine Branch, 2010), 1-2.

²⁹ Ken Pennie, "Strategy and the F-35," *FrontLine Defence Magazine*, 2011, 36.

argument is that there is not a significant change between more recent or updated fourth generation fighters, the impact of a fifth generation fighter is of relevance to a discussion of potential doctrinal change. In this discussion the F35 will be used as the example since this is the fighter in which Canada has already invested development dollars.³⁰ New technology such as the F-35 can often lead to the potential to change the way that military power is applied to warfare. In this section the technological advance made by the F35 will be examined followed by a discussion in the next section of how this advance will influence doctrine and employment at the operational level.

Capabilities of F35

Fifth generation aircraft are defined as having five key features that distinguish them from other fighter aircraft. These features include a reduced radar cross section, and reduced visibility to infrared sensors; sensor fusion with scanned array radar; linked electronics to share data with other aircraft; advanced avionics and engines; and supersonic cruise capability.³¹ The JSF has produced three different variants of the F-35, which possess the characteristics of fifth generation aircraft. The three variants are the F-35A conventional takeoff and landing (CTOL), the F-35B short takeoff/vertical landing (STOVL), and the F-35C carrier variant (CV).³² The CAF has found that the F-35A

³⁰ Tolga R. Yalkin . and Peter Weltman, *An Estimate of the Fiscal Impact of Canada's Proposed Acquisition of the F-35 Lightning II Joint Strike Fighter* (Ottawa, Canada: Office of the Parliamentary Budget Officer,[2011]),. 2.

³¹ Hunt, *Analysis: Expectations for Deployment of Fifth-Generation Fighters*, Vol. 2015 <http://www.janes.com/article/43616/analysis-expectations-for-deployment-of-fifth-generation-fighters>, (2014).

³² Joint Strike Fighter Program Office, "The F-35 Lightning II," www.jsf.mil/f35/index.htm (accessed May 10, 2015).

variant with conventional takeoff and landing is more suitable for our defence needs than the short take off or carrier based variants.³³

A reduction in radar cross section and reduced visibility to sensors, or stealth, is one of the primary characteristics of the F-35. Stealth technology is a combination of aircraft characteristics including shape, material, and sensors that contribute to it being less visible to radar or infrared sensors. Stealth aircraft also have a trade-off between payload involving any external weapons and an associated increase in visibility due to the external stores. For this reason there is normally an associated trade off with the stealth of the aircraft and its ability to conduct air to ground missions, however, the F-35 has an internal stores capability that alleviates this concern for some mission profiles.³⁴ In addition, the F-35 is built with stealth in mind, so it incorporates several characteristics such as external wing design, radar absorbing material, and active sensors that further reduce its visibility.³⁵ This gives the aircraft a significant advantage when operating in an environment with extensive air defence capabilities or fighting a 4th generation aircraft in the air. Although there are arguments that there will rarely be a need to operate in a dense air defence network because very few countries possess these systems, the stealth capability will be invaluable if this circumstance does arise.³⁶ If the CF purchases the F-35, this will be the first aircraft in the RCAF inventory that has stealth technology.

³³ Yalkin and Weltman, *An Estimate of the Fiscal Impact of Canada's Proposed Acquisition of the F-35 Lightning II Joint Strike Fighter* (Ottawa, Canada: Office of the Parliamentary Budget Officer, 2011), 65.

³⁴ Marco Wyss and Alex Wilner, "The Next Generation Fighter Club: How Shifting Markets Will Shape Canada's F-35 Debate," *Canadian Military Journal* 12, no. 2 (Spring 2012), 18-27.

³⁵ Joint Strike Fighter Program Office, *The F-35 Lightning II*, www.jsf.mil/f35/index.htm, Vol. 2015.

³⁶ Hunt, *Analysis: Expectations for Deployment of Fifth-Generation Fighters*, Vol. 2015 (<http://www.janes.com/article/43616/analysis-expectations-for-deployment-of-fifth-generation-fighters>, 2014).

The other four characteristics of a fifth generation aircraft that the F-35 possesses are also critical advantages. The overall sensor package on the F-35 and its ability to combine the data from all sensors is called data fusion. Data fusion allows for compression of the Observe, Orient, Decide, and Act (OODA) loop decision making cycle since the information is presented to the pilot, not just the raw data.³⁷ In addition to the fast processing of this information, the 360 degree, 800 mile radius of combat space that can be managed and operated provides a considerable advantage. The F-35 also has the ability to share the data from its 360 degree sensors with other F-35's and other aircraft, which can provide a timely Information, Surveillance, Reconnaissance (ISR) picture. The F-35 also possesses advanced avionics that are able to interact with each other allowing the combat system to be managed in part by the computer on board.³⁸ As well, the F-35 has advanced engines, but they do not have a supersonic cruise capability, so will not present a need for a doctrinal change.³⁹ The impact of the F-35's capabilities will be discussed further in the next section to demonstrate how they will impact CF operations.

IMPLICATIONS OF F35 AIRCRAFT ON POLICY AND JOINT DOCTRINE

The technological advance that the F-35 presents to the CF will be reviewed in regards to current Canadian Defence Policy and doctrine in this section. Many of the references in this section discuss the employment of the F-35 in the United States due to

³⁷ Robbin F. Laird and Edward T. Timperlake, "The F-35 and the Future of Power Projection," *JFQ: Joint Force Quarterly*, no. 66 (2012, 2012), 89.

³⁸ Robbin F. Laird and Edward T. Timperlake, "The F-35 and the Future of Power Projection," *JFQ: Joint Force Quarterly*, no. 66 (2012, 2012), 88.

³⁹ Wyss and Wilner, *The Next Generation Fighter Club: How Shifting Markets Will Shape Canada's F-35 Debate*, Vol. 12, 20.

their recent experience when flying this aircraft. There are also some concepts introduced that are part of USAF doctrine, which could be applied in Canada to assist with the transition to a fifth generation fighter.

Policy

There has been much debate in Canada regarding the purchase of the F-35 as a replacement for the CF-18. Although the acquisition of a fifth generation fighter will not likely change any of the enduring politics for direction to the military, it does support the intent of the policy makers in the long term. According to the Canada First Defence Strategy, besides the commitment to purchase “65 next generation fighter aircraft”⁴⁰, the CAF is directed to continue to provide surveillance and defence of Canadian territory. In order to achieve this with the associated expectation of maintaining interoperability with the United States, the F-35 is one of the best options. Proponents of the F-35 purchase argue that the acquisition of a capable fighter aircraft is required for Canada to contribute to any alliance or coalition missions internationally.⁴¹ Supporters of the purchase also argue that the F-35 is the best option to keep pace with the changing fighter industry, and that the F-35 is the most in line with Canada’s purchasing preferences and alliances.⁴² Critics state that Canada will be paying a premium for technology that will likely be out of date before it is actually used in operations, and debate whether Canada would get just as much benefit out of upgraded fourth generation platforms.⁴³ There is merit to both

⁴⁰ Canada. Department of National Defence, *Canada First Defence Strategy*, 2008), 4.

⁴¹ Wyss and Wilner, *The Next Generation Fighter Club: How Shifting Markets Will Shape Canada's F-35 Debate*, Vol. 12, 19.

⁴² *Ibid.*, 20.

⁴³ Major J. D. McKillip, R. W. H. McKillip and Colonel Kevin Truss, "F-35s and the Canadian Military Technical Condition," *The Royal Canadian Air Force Journal* 3, no. 3 (Summer 2014), 57.

debates; however the purchase of the F-35 is supported by the requirements stated in the Canada First Defence Strategy.

Implications to Current Doctrine

As outlined in the doctrine section above, changes to doctrine come as a result of a change in technology, theory, effects, or experience. The combination of sensors and weapons on the F-35 will impact the way that aircraft to conduct activities in the act and sense functions of aerospace power.

By exploiting the stealth technology on the F-35, the platform can be used to effectively shape the battlefield. The act function of aerospace power consists of the ability to shape the battlefield and move personnel and material quickly.⁴⁴ Shaping the battlefield can be conducted through strategic effect by disrupting an adversary's center of gravity by bringing an F-35 to the battle space it may change how the adversary reacts even if they have extensive air defence networks. Based on the assessment of the threat environment by James, there are not a lot of extensive air defense networks that would justify the use of stealth that is inherent in the 5th generation aircraft,⁴⁵ however one could argue that if such an environment was encountered stealth would bring an advantage to gain control of the air. This in combination with the extensive firepower on the F-35 platform, and its electronic warfare capability allow the F-35 to shape the

⁴⁴ Canada. Department of National Defence. B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine* Ottawa:Chief of the Air Staff, 2010)., 40.

⁴⁵ Hunt, *Analysis: Expectations for Deployment of Fifth-Generation Fighters*, Vol. 2015 <http://www.janes.com/article/43616/analysis-expectations-for-deployment-of-fifth-generation-fighters>, 2014).

battlefield through kinetic and information operations in a way that fourth generation aircraft cannot.⁴⁶

One of the biggest technological advantages brought by the F-35 is the increased ISR and avionics suite. The first improvement is an increased ability to quickly collect and interpret ISR data on the platform.⁴⁷ This enhances the sense function of aerospace power allowing increased information on the situation to be exploited from the same platform that is delivering kinetic effects. In addition the F-35 has an electronic warfare suite that can jam the equipment of other nearby aircraft, delivering an effect that would require a second platform to be nearby on older generations of fighter aircraft.⁴⁸ These improvements to the sense and shield functions demonstrate multiple capabilities in one platform that conform to existing doctrine.

The improvements that the F-35 brings to the functions of aerospace power outlined are significant, but do not change the way that these functions are performed. The capabilities of the F-35 do not impact enough to constitute an immediate doctrinal change upon acquisition of the platform. However, after the RCAF develops experience and learns from the USAF the doctrine may need to be updated.

Perhaps the biggest potential for change in the current aerospace doctrine is to impact the command function of Aerospace power. The RCAF complies with the tenet of aerospace power that command and control of air assets is conducted through

⁴⁶ Laird and Timperlake, *The F-35 and the Future of Power Projection* (Superintendent of Documents, 2012), 85-93.

⁴⁷ Robbin F. Laird and Edward T. Timperlake, "The F-35 and the Future of Power Projection," *JFQ: Joint Force Quarterly*, no. 66 (2012, 2012), 88.

⁴⁸ David A. Deptula, "A New Era for Command and Control of Aerospace Operations," *Air and Space Power Journal* July-August (2014), 5-16.

centralized control and decentralized execution.⁴⁹ This principle allows for the air component commander to assign available assets and assign their priority for the campaign, while the commanders at the lower levels to execute assigned missions. The USAF community has identified that the improved level of awareness of the battlefield requires an adaptation to the centralized command and decentralized execution philosophy as outlined below. During operations for USAF in Iraq and Afghanistan, control of aerospace assets became more decentralized to allow for increased flexibility in the battle space.⁵⁰ One of the most challenging areas for communications in the USAF AOR is the Pacific Air Forces Command where there is often a degraded environment. Review of Pacific Air Forces command and control (C2) philosophy resulted in the identification of six critical capabilities: “battle space awareness, resilient architecture, defensive cyberspace operations, combat support C2 (CSC2), C2 execution, and war-fighter integration.”⁵¹ For the F-35, battle space awareness will be improved due to the amount and speed of information that is provided through the platform. Due to the sheer volume of information that is available through ISR platforms, this information must be managed by commanders to determine how much information is collected, and develop information management requirements. This information can be acted on by the operational level commander to personnel at the tactical level, if they are given the authority to do so. Due to these challenges, the USAF community is discussing a concept of “centralized command, distributed control, and decentralized execution.”⁵² The intent of changing the C2 structure in this way for certain circumstances is to allow the tactical

⁴⁹ Canada. Department of National Defence. B-GA-400-000/FP-000, *Canadian Forces Aerospace Doctrine* (Ottawa: Chief of the Air Staff, 2010), 28.

⁵⁰ Eric Theriault, "Empowered Commanders," *Air & Space Power Journal* 29, no. 1 (Jan, 2015), 105.

⁵¹ Eric Theriault, "Empowered Commanders," *Air & Space Power Journal* 29, no. 1 (Jan, 2015), 103.

⁵² Deptula, *A New Era for Command and Control of Aerospace Operations*, Vol. July-August, 2014), 13.

commander to use the information at hand to rapidly deploy effects. The primary advantage of this new concept is that it allows the tactical commander to communicate and coordinate with other control nodes in the area of operations quickly. This same adaptation of command and control philosophy may be of value to the RCAF when operating in similar environments and should be a consideration when reviewing doctrine for the implementation of the F-35.

Other Issues at the Operational level

Canadian Forces Joint Doctrine itself will not be impacted by the introduction of the F-35, due to its generic nature in outlining the organization of joint operations, but not delving into the details of how operations are conducted. Below are discussions on training and air-mindedness are some considerations that must be taken into account at the operational level in regards to understanding how best to employ the F-35.

Training

Training required for F35 pilots and those that will employ them at the operational level is required to ensure that they are not simply employed as another fighter aircraft. Training for F35 will be combination of live, virtual and constructive training due to the high cost of flying the aircraft and the risk associated with training some of the maneuvers. The United States Department of Defence commissioned a report from RAND regarding training options for fifth generation fighters to include both live and simulated training.⁵³ The RAND report provides recommendations for increased

⁵³ John A. Ausink et al., *Investment Strategies for Improving Fifth Generation Fighter Training* (RAND Corporation,[2011]).

infrastructure and capability for training including simulators. Advantage of more simulator training is that targeting approaches can be made with lower costs for fuel and maintenance. For a similar simulator system, this would be quite costly for Canada to purchase one for both major bases. Simulators are often seen as a potential way to cut costs in times of budgetary constraints, however this may not be possible if the simulator is already fully booked for regular training sorties. Budgetary cuts always make it difficult to ensure sufficient live sorties, these cannot necessarily be replaced by increased simulator sorties especially if these simulator missions are an integral part of the training regimen and there are only enough resources to operate the baseline number of missions.⁵⁴ The advantage of these simulation capabilities is that it may allow these simulation systems to be integrated in to the existing training simulators in CAF inventory. This would allow for joint commanders to be able to train to best understand and benefit from the capabilities of the F-35 through joint training.

Airmindedness and Leadership

As the fifth generation aircraft comes on line there will be a temptation to use these aircraft in the same way the F18 fighter aircraft have been used in the past. It will be important to have personnel within the Canadian Joint Operational Command (CJOC) and the RCAF who understand what the fifth generation aircraft bring to the joint fight. At the operational level, leaders and planners must be aware of the tactics employed by the F-35 to bridge the knowledge gap to the strategic level.⁵⁵ As increasing levels of

⁵⁴ John A. Ausink et al., *Investment Strategies for Improving Fifth Generation Fighter Training* RAND Corporation, [2011]), 61

⁵⁵ Canada. Department of National Defence. B-GJ-005-000/FP-001, *Canadian Forces Joint Publication: CFJP 01 Canadian Military Doctrine* Ottawa: Joint Doctrine Branch, 2009).

technology and changes in the RCAF fleets occur, commanders from all environments of the CAF will be well served to have an understanding of how the new technology can be exploited.

USAF doctrine outlines at length the importance of air mindedness as related to air force officers as well as to the joint operations. This is one aspect that is not prevalent in RCAF or CAF joint doctrine. The premise is that “airmindedness enables Airmen to think and act at the tactical, operational, and strategic levels of war, simultaneously if called for.”⁵⁶ USAF doctrine also reiterates the importance of properly using a resource or medium to the best warfighting effect. The air force doctrine outlines the optimal terms leading to a strong coalition or joint context, with an acknowledgement of the mistakes of the past that have eroded the joint context. Key terms such as “doctrine is about organization not organizations” and “synergy not segregation” outline how the joint context can sometimes lead to the different environments championing their own causes.⁵⁷ These types of concepts are important at the operational headquarters to ensure the right balance of force for the situation and integration between environments.

This concept has definitely been considered from an RCAF perspective regarding how to best incorporate this into the way of doing business within the CAF, but has not been incorporated in to doctrine. Airmindedness in the Canadian Forces first needs to be adopted by the RCAF to ensure that senior air officers understand not only their specialty or fleet, but also the capabilities and applications of other air power platforms.⁵⁸ The benefits of an improved understanding of airpower for personnel of the other services is

⁵⁶ United States. United States Air Force, *Air Force Doctrine Document*, Vol. 1, 2015), 3.

⁵⁷ *Ibid.*, 4.

⁵⁸ Christopher J. Coates, "Air-mindedness: An Essential Element of Air Power," *The Royal Canadian Air Force Journal* 3, no. 1 (Winter 2014), 79.

also seen as a benefit.⁵⁹ The article by BGen Coates goes on to outline that training other forces personnel to be more familiar with air power capabilities is being approached by leveraging existing joint training opportunities or additional personnel being taught on existing air force courses. A comprehensive understanding of the battle space including the airspace will allow commanders to better incorporate the ISR, stealth, and data fusion characteristics of the F-35. Incorporating air-mindedness into RCAF doctrine would be a terrific starting point to increase air-mindedness in the joint Canadian Forces Community.

CONCLUSION

Through the last 91 years of the RCAF there have been evolutions in doctrine and command and control as a result of changing technology, adversaries, or tactics. The acquisition of the F35 will influence the application of doctrine and policy within the CF. The discussion outlined above reviewed the current CF doctrine and policy that guide the CF operational actions, and provided explanations for why doctrine might change or adapt to current technology. The capabilities of the F-35 were outlined and addressed in terms of how these capabilities will influence RCAF doctrine. The multi-role capability of the F-35 is expected to bring a change to how the RCAF conducts sense and act functions. This multi-role platform could facilitate a reduction of air power platforms in the battle space that are required to conduct kinetic and ISR missions. It was also shown that a fifth generation aircraft has already prompted discussions about whether the tenet of centralized control, decentralized execution is sufficient to guide the C2 of future operations involving platforms that have a high level of capability on their own. The importance of understanding and exploiting the complexity of the F-35 and the various

⁵⁹ *Ibid.*, 78.

tasks that it can conduct will need to be facilitated by training and education both within the RCAF and within the other environments. This was further promoted by the recommendation of including the concept of airmindedness into RCAF doctrine. The F-35 will influence application of the RCAF at the operational level by being employed in roles other than strictly delivering kinetic effects. Agility is one of the key tenets of airpower and a critical part of assuring the ability to tailor the forces to the tasks is having the latest technology and setting the conditions to exploit it. The F-35 may be coming to Canada, and the RCAF and joint community need to be prepared to use it to its full potential.

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