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RCAF TACTICAL AIRLIFT IN THE FUTURE OPERATING ENVIRONMENT

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AIM

1. The aim of this paper is to provide Commander 1 Canadian Air Division (Comd 1 CAD) with an examination of the current Royal Canadian Air Force (RCAF) tactical airlift capability. It will highlight the changing nature of conflict, including the evolution of Anti-Access and Area-Denial (A2/AD) systems and the non-permissive environments that they create. This paper will concentrate on the perceived future threat environment, current airframe capabilities, and concerns with regard to future employment. It will discuss operational considerations and will conclude with recommendations as to what the RCAF needs to do to effectively utilize Air Mobility assets tactically in the future.

INTRODUCTION

2. RCAF Doctrine defines Air Mobility as "the delivery of personnel or materiel by air, independent of platform type… [and] as a core air power capability, air-mobility activities are employed across the spectrum of conflict."[1] In the future, this spectrum of conflict will undoubtedly include the presence of Anti-Access and Area-Denial (A2/AD) systems, which are already being used by a number of our adversaries. The reality of A2/AD and its sophisticated weapons systems are creating a wicked problem for conventional forces and their ageing equipment, which have often not been updated as the threat has increased. This is a particular problem in the RCAF Air Mobility fleets, which do not currently have the means to operate in or near a non-permissive environment.

[1] Department of National Defence, B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine* (Ottawa: DND Canada, 2016), 34.

3. This paper will highlight the gaps in Canada's Tactical Airlift capability and discussed the challenge that A2/AD systems will bring to the battlespace of the future. It will then provide recommendations for immediate changes to RCAF procedures and equipment, including investment in state-of-the-art electronic warfare capabilities and aircrew training.

DISCUSSION

4. The mission of the Royal Canadian Air Force (RCAF) is "to provide the CAF with relevant, responsive and effective air power to meet the defence challenges of today and into the future,"[2] which must include maintaining a safe and effective way to get troops into and out of theatres of operations. The RCAF's *Future Air Operating Concept* notes that Canadian National Military Strategy has three key roles, one of which is "contributing to international peace and security," which, for the RCAF, is expected to occur through the Expeditionary Air Operating Concept. The RCAF breaks this concept down further into eleven RCAF Functional Areas, one of which notes specifically that "RCAF Operations in High Intensity, A2/AD Conflicts" is a priority for the force into the future.[3] Canada's *Future Security Environment 2013-2040* warns that "contemporary A2/AD challenges have the potential to undermine many current strategic and operational assumptions "[4] through its ability to target military capabilities in all domains, including cyber and electromagnetic as well as in the traditional physical environments.

[2] Department of National Defence, A-GA-007-000/AF-008, *Air Force Vectors* (Ottawa: DND Canada, 2014), 34.
[3] Department of National Defence, *Future Concepts Direction Part 2: Future Air Operating Concept* (Ottawa: DND Canada, 2016), 12.
[4] Department of National Defence, A-FD-005-001/AF-003, *The Future Security Environment: 2013-2040* (Ottawa: DND Canada, 2014), 111.

5. Anti-Access and Area-Denial (A2/AD) capabilities seek to create environments that are non-permissive for the enemy. Ideally, the goal is to deny the enemy access to a region, area or specific target, and then make it exceptionally difficult for them to stay in the area should they succeed in entering it.[5] The *Future Air Operating Concept* defines anti-access and area-denial (A2/AD) as the "action intended to slow deployment of friendly forces into a theatre or cause forces to operate from distances farther from the locus of conflict than they would otherwise prefer," and further, the "action intended to impede friendly operations within areas where an adversary cannot or will not prevent access."[6] A current example of an A2/AD bubble is the one that Russia has created around the Baltic countries of Estonia, Latvia and Lithuania. By positioning their A2/AD systems in their small enclave of Kaliningrad, Russia has created a massive bubble that sweeps almost to Canada's northernmost coast.[7]

6. Traditionally the Canadian Armed Forces (CAF) have "enjoyed the ability to forward deploy to bases and sustain them by means of relatively secure lines of communication [but] fiscal challenges and growing adversary A2/AD capabilities have placed limits on this freedom."[8] In order to be able to operate all over the world into the future, Canada must develop a "capable intra- and inter-theatre lift and logistical support

[5] Guillaume Lasconjarias, "NATO's response to Russian A2/AD in the Baltic States: Going Beyond Conventional?," *Scandinavian Journal of Military Studies*, 2(1), 76.
[6] Department of National Defence, *Future Concepts Direction Part 2: Future Air Operating Concept* (Ottawa: DND Canada, 2016), 32 – definition taken from Air-Sea Battle Office, "Air-Sea Battle: Service Collaboration to Address Anti-Access & Area Denial Challenges" (Washington, DC: May 2013).
[7] W.A. Camm, "Area defence in the Baltic Region: A2/AD, Russia and NATO" (Joint Command and Staff Program Paper, Canadian Forces College, 2020), 7.
[8] Richard Goette, *Preparing the RCAF for the Future: Defining Potential Niches for Expeditionary Operations* (Ottawa, DND Canada, 2020), 8.

[capability] appropriate to these operating conditions,"[9] which it does not currently have. Ideally, this would also include an airdrop capability, as "the purpose of airdrop is to deploy personnel or equipment in support of combat/ humanitarian operations and to aid recovery or resupply of personnel in a hostile environment,"[10] which clearly describes the A2/AD environment.

7. Currently, the RCAF has two tactical airlift capable air mobility fleets: the CC-130J Super Hercules and the CC-177 Globemaster III. Both aircraft are equipped with countermeasures, which allow them to operate in Threat System Category (TSC) 1 environments. This TSC includes threats such as Small-Arms, Anti-Aircraft Artillery, Infrared Guided Missiles and laser-guided threats, but assumes that air superiority is likely.[11] Per their respective Standard Manoeuvre Manuals (SMM), in addition to being able to conduct low-level tactical flying, both aircraft can also conduct Container Delivery Systems (CDS) airdrops, Heavy Equipment (HE) airdrops, and Personnel (Pers) airdrops. The CC-177 can drop 40 CDS containers at 2,200 pounds each,[12] 102 combat-rigged paratroopers, [13] and HE up to 110,000 total pounds.[14] Comparatively, the CC-

[9] Defence Research and Development Canada, DRDC-RDDC-2015-L223, *Considerations for defining the future of Canadian military air power* (Ottawa: DND Canada, 2015), 5.
[10] Department of National Defence, SMM 60-177-1000, *Air Mobility Standard Manoeuvre Manual: CC177 Globemaster III Operations* (Ottawa: DND Canada, 2016), 19-1.
[11] *Ibid*, 11-38.
[12] *Ibid*, 19-37.
[13] *Ibid*, 19-34.
[14] Boeing, "C-17 Globemaster Technical Specifications," last accessed 06 February 2021, https://www.boeing.com/defense/c-17-globemaster-iii/#/technical-specifications.

130J can drop 24 CDS containers at 2,200 pounds each,[15] 40 combat-rigged paratroopers,[16] and HE up to 42,000 total pounds.[17]

CC-177 Globemaster III

8. The current designated use of the CC-177 is to "transport troops, cargo and oversized combat equipment… fly long distances and land in remote airfields."[18] However, when Canada first bought the jets in 2007, the intention was also to use them for low level tactical flying and airdrop missions, which would enable the RCAF to reach into anywhere they needed to and into nearly any threat environment. However, by the time the project reached Initial Operational Capability (IOC)[19] upon the arrival of the fifth and final aircraft on 30 March 2015[20], the scale of the project had changed, and the acquisition's project summary was amended to read that the aircraft would be used only to "rapidly transport oversized cargo over long distances between continents…[and] operate from remote, unpaved runways."[21]

9. On 13 August 2014, 429 (T) Squadron, the only RCAF Squadron that flies the CC-177, was ordered by Comd 1 CAD to cease all airdrop training effective immediately

[15] Department of National Defence, SMM 60-130J-1000, *Air Mobility Standard Manoeuvre Manual: CC130J Hercules Operations* (Ottawa: DND Canada, 2020), 18-34.
[16] *Ibid,* 18-39.
[17] *Ibid,* 18-27.
[18] Royal Canadian Air Force, "CC-177 Globemaster III Fact Sheet," last accessed 05 February 2021, http://www.rcaf-arc.forces.gc.ca/en/aircraft-current/cc-177.page.
[19]Department of National Defence, *Project Approval Directive* (Ottawa: 2019), 367. Initial Operational Capability is defined as "the first attainment during Implementation of the minimum ability to effectively employ a new or improved capability for which adequate infrastructure, training, staffing and support is in place, both for the new capability and the organization that is employing it."
[20] Government of Canada, "CC-177 Globemaster procurement project," last accessed 05 February 2021, http://www.canada.ca/en/department-national-defence/services/procurement/cc-177-globemaster.html.
[21] *Ibid.*

in a bid to save money and flying hours (YFR) on an already overstretched fleet.[22] After subsequently receiving a significant YFR increase for the following fiscal year, the Squadron lobbied hard to return to airdrop training before all of their qualified aircrew's qualifications expired but were denied. The flying hours were re-apportioned to strategic airlift requirements for current operations. Ultimately, the RCAF lost all current airdrop capability on the platform, as well as planned capability upgrades, including Major Air Disaster (MAJAID) and 25,000 MSL High Altitude-Low Opening/High Altitude-High Opening (HALO/HAHO) Pers drop projects. The net gain ended up being approximately $1.62M annually in cost savings, between YFR and crew training bills over a projected 120 training hours.[23]

10. After the airdrop program was cancelled in 2014, the decision quickly followed to cancel the low-level flying program on the aircraft the following year. Although the primary purpose of conducting low-level tactical mission is "to gain the element of surprise, to minimize the effectiveness of anti-aircraft defences; and to avoid detection and interception,"[24] the decision was made to prioritize Strategic lift over all other training requiring dedicated YFR. Admittedly, the number one advantage of low level flight is reduced exposure to air defence threats "since most air defence systems are restricted to line of sight (LOS) for fire control [and] a low-flying aircraft employing terrain-masking techniques is more difficult to track accurately, "[25] which simply did not exist anywhere that the RCAF was operating in 2014 and 2015. That being said, should

[22] Briefing Note, *Restoration of CC177 Airdrop Capability*, provided to Commander 8 Wing by 429 (T) Squadron Commanding Officer, 24 Mar 2015.
[23] *Ibid.*
[24] Department of National Defence, SMM 60-177-1000, *Air Mobility Standard Manoeuvre Manual: CC177 Globemaster III Operations* (Ottawa: DND Canada, 2016), 4-8.
[25] *Ibid,* 11-6.

the nature of conflict and the future operating environment continue to change in the manner postulated in the RCAF's *Future Air Operating Concept*, then the loss of such a valuable capability might quickly become a regret.

11. A significant advantage to low-level tactical flying is its unpredictability. Airdrop in particular can "maximize the number of personnel and equipment delivered to a single location in a short period of time [and] may allow an element of surprise."[26] Additionally, "objective area ground support, material handling equipment (MHE), and site preparation requirements can be minimal to nonexistent,"[27] which is vital when trying to insert personnel and/or equipment into a combat zone without being noticed. Tactical low-level arrivals and departures are particularly valuable, as they allow the aircraft "to minimize the time spent within the threat environment"[28] and thus, decrease the likelihood that they will be spotted by the enemy. Beyond these combat roles, airdrop can also be used to deliver aid to crash survivors during Search and Rescue or MAJAID missions, resupplying Canada's northernmost peoples if their ice roads are melted from Climate Change or dropping food and water to otherwise unreachable survivors of humanitarian disasters like earthquakes and floods. The CC-177 *Concept of Airdrop Operations* argues that "the ability to airdrop personnel and equipment from transport aircraft will continue to play a crucial role [within the spectrum of aerospace applications]"[29] and "the introduction into service of the CC177 has provided the CF with

[26] Department of National Defence, SMM 60-177-1000, *Air Mobility Standard Manoeuvre Manual: CC177 Globemaster III Operations* (Ottawa: DND Canada, 2016), 19-1.
[27] *Ibid.*
[28] Department of National Defence, SMM 60-177-1000, *Air Mobility Standard Manoeuvre Manual: CC177 Globemaster III Operations* (Ottawa: DND Canada, 2016), 9-15.
[29] Briefing Note, *Concept of Operations: CC177 Airdrop Operations*, provided to Commander 1 Canadian Air Division by A3 Transport Readiness, Jan 2011.

a new opportunity to expand the airdrop role," a statement that remains true today, and will become even more crucial in future operating environments.

CC-130J Hercules

12. The CC-130J procurement project summary identifies the Super Hercules as "the workhorse of the Canadian Armed Forces' transport fleet [that] provides support to joint operations at home and overseas. CC-130J Hercules aircraft quickly and safely carry passengers, heavy equipment and supplies over long distances to support operations."[30] Additionally, 436 (T) Squadron, the unit that exclusively flies the CC-130J in Canada, is fully qualified to conduct all manner of previously mentioned airdrops, including in formations of two, effectively doubling their available offload to 48 CDS containers at 2,200 pounds each,[31] 80 combat-rigged paratroopers,[32] and HE up to 84,000 total pounds. While this formation capability allows for approximately 20% greater CDS load total weight to be dropped than from the CC-177, it remains nearly 25% short for both PERS and HE loads.

13. There is currently no risk of the CC-130J tactical airlift capabilities being reduced. It remains the only tactical airlift asset in RCAF inventory, and Full Operational Capability (FOC)[33] was only declared in February 2019 with expected project close-out scheduled to occur in September 2022. 436 (T) Squadron trains to formation low-level

[30] Government of Canada, "CC-130J Hercules tactical airlift procurement project," last accessed 05 February 2021, https://www.canada.ca/en/department-national-defence/services/procurement/cc-130j-hercules.html.
[31] Department of National Defence, SMM 60-130J-1000, *Air Mobility Standard Manoeuvre Manual: CC130J Hercules Operations* (Ottawa: DND Canada, 2020), 18-34.
[32] *Ibid,* 18-39.
[33] Department of National Defence, *Project Approval Directive* (Ottawa: 2019), 364. Full Operational Capability is defined as "the ability to effectively employ a delivered capability for which the required infrastructure, training, staffing and support are fully in place as detailed in the Statement of Requirements (SOR).".

flying and airdrops on a daily basis and all crews are qualified on multiple types of airdrops, most of them also maintaining formation currencies. Additionally, the Squadron has been deployed to Op IMPACT in Kuwait since 2014 conducting routine tactical airlift missions. During their time in theatre, the Squadron has conducted 4,452 sorties, where they moved 14.6 million pounds of cargo and 8,488 passengers.[34]

14. Textron Systems recently delivered the brand-new CC-130J electronic warfare threat simulator, which significantly increases the capability and proficiency of the CC-130J crews to operate in threat environments. According to the project approval, "this simulator will increase the performance of the CC-130J self-defense system [which] detects the launch of hostile anti-aircraft missiles and dispenses chaff and flares to defeat the missile."[35] The CC-130J SMM states that since "it is likely that some missions will occur in theatres of operation where potential ground and air threats exist… All missions operating in an EW environment should be backed by pre- and post-flight Electronic Warfare Support.[36]

Challenges

15. The CC-130J remains well-positioned and trained to conduct low-level tactical flying well into the future. With updated countermeasures systems and the new electronic warfare threat simulator, 436 (T) Squadron remains on track to deliver "On

[34] Government of Canada, "Operation IMPACT", last accessed 05 February 2021, https://www.canada.ca/en/department-national-defence/services/operations/military-operations/current-operations/operation-impact.html.
[35] Government of Canada, "CC-130J Hercules tactical airlift procurement project," last accessed 05 February 2021, https://www.canada.ca/en/department-national-defence/services/procurement/cc-130j-hercules.html.
[36] Department of National Defence, SMM 60-130J-1000, *Air Mobility Standard Manoeuvre Manual: CC130J Hercules Operations* (Ottawa: DND Canada, 2020), 4-7.

Time, On Target" wherever they are asked to go. However, when conducting airdrops as a single ship, they are unable to drop loads large enough to insert a reasonable amount of equipment or personnel to a drop zone (DZ). Several aircraft, including the use of multiple formations, may be required depending on the mission (a Brigade Combat Team concept or heavy vehicle insertion, for example), which would increase the threat risk significantly to every subsequent aircraft flying into the area.

16. All previously tactical qualified CC-177 aircrew have expired and are no longer able to conduct these missions. Since the CC-117 does not have an in-house training system and has always out-sourced their ab-initio Pilot and Loadmaster training to units in the United States and the United Kingdom, any kind of re-qualification program would need to be conducted internationally. Without a local simulator, the currency and training bill would simply be too high for current resources.[37] That being said, all low-level tactics, including airdrop, remain nascent in the current CC-177 SMM for potential use in the future.

CONCLUSION

17. Significant investment is being made to the RCAF in terms of new space-based assets and replacements to existing fleets (CP-140 Aurora, CF-18 Hornet, CC-138 Twin Otter and the new Fixed Wing Search and Rescue platform).[38] However, they will all be useless in future conflicts without the ability to get people and equipment into and out of the non-permissive environments that the rest of the CAF will be operating in. The new

[37] CO 429 (T) Sqn, personal communication, 05 Feb 2020.
[38] Department of National Defence, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa: DND Canada, 2017), 39.

Canadian Defence Policy, *Strong, Secure, Engaged* states that three key security trends will shape the future of conflict: "the evolving balance of power, the changing nature of conflict, and the rapid evolution of technology,"[39] however, none of those elements are being addressed in a meaningful way when it comes to Air Mobility modernization and must be, in order to field a relevant fighting force into the future

RECOMMENDATIONS

18. The following actions are recommended to ensure that the RCAF has the ability to use Air Mobility assets in the battlefields of the future:

a. Procure a CC-177 simulator and immediately invest in developing an in-house RCAF training program;

b. Immediately re-qualify CC-177 crews to conduct tactical airlift missions, including both low-level flying and airdrop;

c. Create a robust Air Mobility Electronic Warfare training and development unit, which encompasses the EW SME's from all Air Mobility units; and

d. Invest in new countermeasures systems for all RCAF Air Mobility aircraft and roll that training into the existing CC-130J EW simulator project.

[39] Department of National Defence, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa: DND Canada, 2017), 49.

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