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PROVIDING THE SAME WITH LESS: AN EXAMINATION OF FLEET RATIONALIZATION IN THE LARGE FIXED-WING COMMUNITIES OF THE RCAF

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The mission of the Royal Canadian Air Force (RCAF) stands as providing the Canadian Armed Forces (CAF) with "relevant, responsive and effective airpower to meet the defence challenges of today and into the future."[1] Since its inception as a permanent component of Canadian defence in 1924, Canadians have come to expect that the RCAF will capably meet the needs and challenges as of the Government of Canada. In today's RCAF, fiscal pressures continue to weigh heavily on the RCAF's ability to remain relevant, responsive, and effective, and some observers have suggested that current fiscal constraints will force the RCAF to do *less with less*.[2] Extrapolation of current defence spending trends offers credence to the words of the United States Air Force's retired General (Gen) Merrill A. McPeak when he said "the air force must adapt or go the way of the dinosaurs."[3] The Justin Trudeau Liberal Party has proposed to build "a leaner, more agile, [and] better equipped" military which may have signified that cuts in military spending are on the horizon.[4] In order to successfully adapt, the RCAF must strive to deliver at least the same level of service with less funding, or at least provide the *same with less*. This means striking a balance between the maintenance of capabilities and the potential operation of fewer or less capable platforms. The balance to be achieved necessitates that a more rationalized approach to future RCAF platform procurement by the Department of National Defence (DND), the CAF, and the Government of Canada.

As the complexity of air platforms continues to increase, so do the related procurement costs. Complexity, however, can offer significant benefits in capability, specifically in terms of platform modularity and the ability of those platforms to conduct multiple roles from an

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[1] Canada, Department of National Defence, *Air Force Vectors: Abridged*, Ottawa: 2014, iv.
[2] David Perry, "Doing Less with Less: Canadian Defence Transformation and Renewal." *CDA Institute Vimy Paper* (January 2014): 1. https://www.cdainstitute.ca/images/LesswithLessJan2014Perry.pdf
[3] James W. Canan, "McPeak's Plan," *Air Force Magazine* (February 1991). http://www.airforcemag.com/MagazineArchive/Pages/1991/February%201991/0291mcpeak.aspx
[4] Chris Thatcher, "Planning for Power," *Skies Magazine*, 20 April 2016, accessed 22 April 2016. http://skiesmag.com/news/article/Planning-for-power

operational standpoint. This concept applies equally to large multi-engine transport aircraft, as advances in technology have allowed them to become adaptable to their prospective operational demands. For this reason, Canadian military procurement strategies must consider the consolidation of air transport platforms into fewer, but equally capable fleets.

Platform consolidation, or the operation of fewer fleets, is not a new concept for the RCAF, but it must be further refined in order to adapt to the unrelenting fiscal pressures which are currently shaping Canadian defence policy and strategy. The notion of procuring a single platform type capable of meeting all of the needs of the RCAF is currently unrealistic and an over-simplification. Accordingly, this paper will argue that the RCAF must consider merging its fleets with similar performance and capabilities into single platform types. This paper will lend support to this concept by examining the potential benefits associated with the consolidation of fixed-wing search and rescue (FWSAR), air-to-air Refueling (AAR), tactical air mobility (TAL), strategic airlift (STRAT), long range patrol (LRP) and utility aircraft such as the CC-138 Twin Otter into fewer, more adaptable fleets.

In order to support the notion of increased RCAF fleet rationalization, this paper will be divided into three sections. The first will examine past and current trends in Canadian military procurement and spending. This will provide an indication of the importance of fleet rationalization in the recapitalization of the RCAF. Next, it will examine the cost-saving and operational benefits associated with fleet consolidation. Once the benefits of fleet consolidation are identified, it will briefly examine options for large fixed-wing fleet consolidation in today's RCAF.

CANADIAN TRENDS IN MILITARY PROCUREMENT AND DEFENCE SPENDING

Dr. J. Craig Stone, who is a member of the DND Defence Industrial Advisory Committee and expert on defence economics has held that Canadian military procurement processes continue to be "…a perennial burden on both government and industry."[5] Furthermore, in terms of defence spending, Canada has historically been unwilling or incapable of properly equipping the CAF.[6] In order to understand how the concept of fleet rationalization can mitigate both the cumbersome procurement practices and limits in defence spending, an examination must be conducted of past challenges and trends which will likely carry over into the uncertain fiscal and security environment that the CAF will find itself in the near future.

Canada's reluctance to suitably equip its military has been a prominent theme since the time before Confederation. When the Trent Affair of 1861 intensified tensions between Britain and the United States, the manager of British North America's Militia Affairs Portfolio, John A. MacDonald, would be the first witness to this theme in the Canadian context.[7] Canada was the ultimate object of the insult,[8] but MacDonald's proposal of the militia bill, calling for a trained force of 50,000 Canadians at a cost of $500,000 was subsequently rejected and resulted in the resignation of the Cartier-MacDonald administration.[9] This was important for two reasons; first, the rejection of MacDonald's bill had proven that defence expenditures could be politically dangerous,[10] and second, it steered Canadian defence policy towards the welcoming of British forces to fulfill the needs of Canadian defence.[11] The people of BNA saw the expenditures

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[5] J. Craig Stone, "Improving the Acquisition Process in Canada," *The School of Public Policy, SPP Research Papers* 8, issue 16 (April 2015): i. http://www.policyschool.ucalgary.ca/sites/default/files/research/improving-acquisition-process-stone.pdf

[6] Aaron Plamondon, *The Politics of Procurement: Military Acquisition in Canada and the Sea King Helicopter* (Vancouver: UBC Press, 2010), 15.

[7] *Ibid*., 17.

[8] Sir Charles Bruce, *The Broad Stone of Empire: Problems of Crown Colony Administration, with Records of Personal Experience* (New York: Cambridge University Press, 2010), 108.

[9] Plamondon, *The Politics of Procurement…*, 17.

[10] *Ibid*.

[11] Bruce, *The Broad Stone of Empire…*, 109.

associated with MacDonald's proposal as too large given the small size of the British colony,[12] and would instead rely on the military might of the British Empire for their defence.

The reliance on the military might of foreign powers for defence has been echoed throughout Canadian history, and today's geostrategic environment looks much the same, albeit with a replacement of British military might by that of the Americans. Canadian society "…has long looked to the amply funded, amply armed U.S. military as the big time, as the ultimate in military sophistication and fighting power."[13] In the eyes of Canadians, the defence partnership with the United States military remains strong through arrangements such as the North American Air Defence Agreement (NORAD), the North Atlantic Treaty Organization (NATO), the Alaska/Canada/United States (ALCANUS) Military Agreements, and the Defence Production Sharing Agreements.[14] This reliance on American military might seems to have become a mainstay of the Canadian psyche,[15] and as a result, increased defence expenditures are not a priority for the Canadian public. Dr. Stone and Dr. Solomon have noted that when faced with a choice between social programs such as education or health care and defence spending, history has shown that Canadians will choose the former.[16] Based on the long-term economic outlook, they have also suggested that future defence spending will likely be increased to compensate for inflation, but not anything more.[17] In sum, Canadian defence expenditures have been limited throughout the country's existence which indicates that the CAF and DND must further refine the methods of spending in order to achieve the same with less.

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[12] Plamondon, *The Politics of Procurement…*, 17.
[13] Linda McQuaig, *Holding the Bully's Coat: Canada and the U.S. Empire* (Toronto: Doubleday Canada, 2007).
[14] Ian Wahn, "Toward Canadian Identity: The Significance of Foreign Investment," *Osgoode Hall Law Journal* 11, no. 3 (December 1973): 520. http://digitalcommons.osgoode.yorku.ca/cgi/viewcontent.cgi?article=2252&context=ohlj
[15] Devin Conley and Eric Ouellet, "The Canadian Forces and Military Transformation: An Elusive Quest for Efficiency," *The Canadian Army Journal* 14 no. 1 (Spring 2012): 81.
[16] J. Craig Stone and Binyam Solomon, "Canadian Defence Policy and Spending," *Defence and Peace Economics*, Vol 16(3), (June 2005): 150.
[17] *Ibid*. 149.

Notwithstanding the unpromising tendencies in defence expenditures, trends in Canadian procurement have been similarly flawed. Canada's marked inability to successfully procure suitable equipment for its armed forces began at the end of the Boer war, when responsibility for the acquisition of Canadian arms and munitions was devolved to the Canadian government by the British.[18] In 1902, Sir Charles Ross was granted the associated defence contract and his Ross rifle would subsequently accompany Canadian soldiers to the front in 1914.[19] Ross' political and social relationships led to an outcry against war profiteering, but worse still, the rifle was ill-suited for the harsh conditions of trench warfare.[20] It was clear that the Ross rifle did not possess the requisite capability required by the Canadian military at the time. While the dire consequences associated with the Ross rifle have not since been repeated, Canada is still challenged in selecting the most appropriate equipment linked to the concept of fleet rationalization. Today's RCAF is advantaged with various capable, albeit aging platforms. In order for consolidation of the RCAF fixed-wing transport fleets to be successful, it is imperative that the *right* modular or multi-role platforms be considered in an effort to avoid another Ross rifle.

In terms of fleet consolidation in the RCAF, Canada has experienced both triumph and failure in selecting appropriate platforms. Canada's procurement of the CF-18 Hornet was one notable success in fleet rationalization; however, the subsequent acquisition of the CH-146 Griffon indicated that Canada has not yet grasped the concept of fleet consolidation from a

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[18] Ken Pole, "Griffons – Upgrade and Replace," *Frontline Defence* 12, no. 6 (2015). http://defence.frontline.online/article/2015/6/3707-Griffons-%E2%80%93-Upgrade-and-Replace

[19] Plamondon, *The Politics of Procurement…*, 18.

[20] Pole, "Griffons...". During the Battle of Ypres in 1915, 3,000 men would abandon their rifles in favour of the Lee-Enfield, and one unidentified Canadian officer would write "it is nothing short of murder to send out men against the enemy with such a weapon." John Ward, "Why Canadians ditched Ross rifle during First World War: It's 'murder to send out men with such a weapon,'" *National Post*, 17 August 2014, last updated 24 January 2016. http://news.nationalpost.com/news/canada/why-canadians-ditched-ross-rifle-during-first-world-war-its-murder-to-send-out-men-with-such-a-weapon

capability perspective. When the CF-18 entered service in 1982, it replaced the CF-5 Freedom Fighter, CF-101 Voodoo and the CF-104 Starfighter, and has been fundamental in Canada's contributions to the defence of North America and expeditionary operations.[21] While the CF-18 has proven itself as a capable platform for consolidation by fulfilling the roles of those fleets that it replaced, the CH-146 Griffon has not. The Griffon, a militarized version of the Bell 412, was purchased in 1992 under the leadership of the Mulroney Conservatives in an effort to trim the defence budget through fleet consolidation.[22] Between 1992 and 1995, 98 Griffons were acquired in order to replace approximately 150 helicopters of four other fleets comprised of the CH-136 Kiowa, CH-118 Iroquois, CH-135 Twin Huey, and CH-147 Chinook.[23,24] The Bell 412 has proven to be a capable platform when fulfilling similar roles to that of a light utility helicopter, but in terms of fleet consolidation, critics of the CH-146 project held that it was not "…big enough to replace the Chinook, nor agile enough to replace the Kiowa while being little more than a replacement for the Twin Huey."[25] Critics have also suggested that the political motivations behind the sole-sourced CH-146 stemmed from an environment where the political gains associated with the Industrial Regional Benefits (IRBs) outweighed the importance of RCAF platform capability requirements.[26] The Canadian commitments in Afghanistan highlighted the capability gaps inherent in the CH-146, and as a result, the Canadian government

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[21] Canada, Public Works and Government Services Canada, "Summary Report – The Evaluation of Options for the Replacement of the CF-18 Fighter Fleet," Government of Canada, 10 December 2014, accessed 21 April 2016. http://www.tpsgc-pwgsc.gc.ca/app-acq/amd-dp/air/snac-nfps/eorfcf18-eorcf18ff-eng.html

[22] Paul Dixon, "The Perils of Procurement: Recent Political Decisions Compare to Past Missteps," *Helicopter Magazine* (15 May 2013). https://www.helicoptersmagazine.com/operations/the-perils-of-procurement-4122

[23] *Ibid*.

[24] Pole, "Griffons...".

[25] Dixon, "The Perils of Procurement…"

[26] See discussion between Mr. Hanger of the Reform Party of Canada and representatives of Industry Canada (Mr. Banigan and Mr. Kane) during a meeting of the Standing Committee on National Defence and Veternas Affairs in March 1999. Canada, House of Commons Committees, Standing Committee on National Defence and Veterans Affairs, NVDA (36-1), 11 March 1999, accessed 14 April 2016. http://www.parl.gc.ca/HousePublications/Publication.aspx?Language=e&Mode=1&Parl=36&Ses=1&DocId=1039300

announced its plan to re-acquire the CH-147 and its related medium-to-heavy lift capability in 2006.[27] The re-investment in the lift capabilities of the CH-147 represented a costly miscalculation of required Canadian military helicopter capabilities as the CH-147 procurement project was valued at $2.3B.[28] By examining the CH-146 procurement as an example of fleet rationalization, it is clear that Canada has not yet understood the importance of selecting suitable equipment which is capable of aptly fulfilling several roles while separating the process from political motivations.

Canada has also struggled with weighing the advantages of competitive tendering versus sole-sourced procurement, and this has been a prevalent theme since the inter-war period. In an effort to improve military equipment acquisition, the Army, Navy and Air Force's procurement processes were consolidated under the chairmanship of the Master General of the Ordinance in 1936,[29] but its first attempt at acquiring military equipment was plagued by controversy. In 1938, the John Inglis Company of Toronto was awarded a contract to produce 7,000 Bren guns for the Canadian military.[30] Unlike the Ross rifle or Griffon helicopter, the Bren gun possessed the capability required by the Canadian military, however, controversy quickly shrouded its acquisition as no public bid process occurred and no other company was given the opportunity to tender the contract.[31] As a result, the Defence Purchasing Board (DPB) was established in 1939 as Canada's first attempt to bridge the gap of requirements in the military procurement process

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[27] Canada, National Defence and the Canadian Armed Forces, "Medium-to-Heavy Lift Helicopter Project: Status," Government of Canada, 25 June 2015, accessed 14 April 2016. http://www.forces.gc.ca/en/news/article.page?doc=medium-to-heavy-lift-helicopter-project-status/hgndblkw

[28] David Perry, "2015 Status Report on Major Defence Equipment Procurements" Canadian Global Affairs Institute, University of Calgary, (December 2015): 53. http://www.policyschool.ucalgary.ca/sites/default/files/research/defence-procurement-perry.pdf
The $2.3B project budget does not include the In-Service Support (ISS) costs for the CH-147 which is estimated at $2.7B until the 2035 timeframe. Canada, "Medium-to-Heavy Lift Helicopter Project…"

[29] Plamondon, *The Politics of Procurement…*, 4.

[30] Pole, "Griffons...".

[31] *Ibid*.

between the soldier and the civilian.[32] The competitive bidding process has since become the *gold standard* in Canadian military procurement, and government decision making remains highly susceptible to public perceptions in that regard.[33]

Retired Colonel (Col) Charles Davies has suggested that there is little empirical evidence supporting the notion that competitive tendering consistently benefits the Canadian public in terms of value for money, and his analysis revealed that there are a number of circumstances where the exemptions of the *Government Contracts Regulations* and tools provided by the *Defence Production Act* can be combined resulting in favourable conditions for sole-sourced contracting.[34] One such circumstance which lends support to sole-sourced procurement is linked to fleet consolidation due to one of the greatest risks associated with the concept. The risk is driven by the sudden appearance of the "Black Swan,"[35] or an aviation incident leading to the grounding of an entire fleet.[36] For this reason, procurement efforts related to fleet consolidation must evolve and endeavour to balance the best value for money for the Canadian public whilst ensuring that tried and true platforms are selected. This is not to say that Canadian procurement for the RCAF should rely exclusively on sole-sourced acquisition, but that it should be strongly considered in the selection of resilient platforms.

Lengthy delays have also long been a reality in the Canadian procurement process and for the RCAF, today's procurement problems have largely stemmed from the extensive cuts to the

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[32] Plamondon, *The Politics of Procurement…*, 4.
[33] Charles Davies, "Competition in Defence Procurement: The Popular Choice, but not always the Right One." *CDA Institute Vimy Paper* (December 2015): 1,16. http://www.cdainstitute.ca/images/Vimy_Papers/Vimy_Paper_26.pdf
[34] *Ibid*., 1.
[35] Joseph Campbell, "Commonality is Economy…" *The Viral Loop*, 18 April 2011, accessed 15 April 2016. https://theviralloop.wordpress.com/2011/04/18/commonality-is-economy/
[36] This was the case after Southwest Airline Flight 812 experienced an explosive decompression on 01 April 2011 resulting in the grounding of 80 of the airline's 737s for immediate inspections and cancellation of over 300 flights. Matt Molnar, "Southwest Airlines Scare: How the 737's Fuselage Weakness Went Undetected." *Popular Mechanics*. 06 April 2011. Accessed 14 April 2016. http://www.popularmechanics.com/flight/a6614/how-southwest-airlines-flight-812-737s-fuselage-weakness-went-undetected-5519864/

military budget in 1994. The cuts meant that the recapitalization and acquisition of the RCAF fleets would be delayed, and as a result, the CAF and DND were forced to pursue several major projects simultaneously in an effort to preserve existing capabilities.[37] Between 2004 and 2006, several major procurement projects were commenced relating to RCAF fixed wing transport, including the airlift capability project (tactical) to replace the aging CC-130 fleet with CC-130J, the airlift capability project (strategic) to acquire the CC-177, and the FWSAR project which intends to replace Canada's aging fixed-wing component providing search and rescue (SAR) capabilities.[38] The CC-177 and CC-130J were originally earmarked for the United States Air Force (USAF) and procured quickly due to the Advance Contract Award Notice (ACAN) approach for the CC-177,[39] and the timely delivery of the CC-130Js occurred in a similar manner to Norway's expedited order.[40] In short, they were acquired in a relatively short timeframe because they were "off-the-shelf" platforms, available for purchase at the time of procurement, and acquired without the competitive bidding process. Their acquisitions, however, may have obscured other procurement challenges associated with the recapitalization of the RCAF.[41]

In the decade between the defence cuts of 1994 and the approval of the new fixed-wing projects, the number of experienced DND program managers in the material group atrophied.[42] The implications of the reduced experience levels became apparent between 2004 and 2009 when the Canadian government nearly doubled the procurement budget, but the increases in

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[37] Philippe Lagassé, "Recapitalizing the Canadian Forces' Major Fleets: Assessing Lingering Controversies and Challenges," *CDFAI* (December 2012): 4. https://d3n8a8pro7vhmx.cloudfront.net/cdfai/pages/95/attachments/original/1413683596/Recapitalizing_the_Canadian_Forces_Major_Fleets.pdf?1413683596

[38] Perry, "2015 Status Report on Major Defence Equipment Procurements," 18, 20, 30.

[39] Defense Industry Daily Staff, "Canada Joining the Angloshpere C-17 Club with CC-177," *Defense Industry Daily*, 17 November 2008, accessed 15 April 2016. http://www.defenseindustrydaily.com/canada-joining-the-anglosphere-c17-club-02388/

[40] Defense Industry Daily Staff, "Replacing Canada's Failing CC-130s: 17 CC-130Js," *Defense Industry Daily*, 31 July 2014, accessed 15 April 2016. http://www.defenseindustrydaily.com/canadas-cc130s-to-fail-in-3-years-4b-rfp-for-replacements-updated-01529/

[41] Lagassé, "Recapitalizing the Canadian Forces' Major Fleets…," 5.

[42] *Ibid*., 4.

capital were not matched by the capacity to manage it.[43] The personnel ratios to manage the funding were approximately 2,600 staff for every $1B in 2003, but by 2009, this ratio was reduced to 1,800 staff for every $1B in procurement capital. Security and defence analyst David Perry has described that "since then, the ratio has only gotten substantially worse."[44] Exaggerated statements of operational requirements (SORs) have also compounded RCAF procurement and have caused "specification creep" [45] stemming from multiple simultaneous acquisition projects.

Fleet consolidation can offer significant advantages in this respect and potentially mitigate the adverse effects of current trends in capital management. While the overall ratio of procurement funds to personnel would likely be unaffected, fleet consolidation implies fewer simultaneous capital projects. As an example, the project budget for the acquisition of the CC-130J was $3.2B, whereas that of the FWSAR project has been revised to $1.55B, for a combined total of $4.75B.[46] Had the two projects been merged, the ratio of capital to personnel would have remained unchanged; however, efficiencies could have been gained in the management of the procurement capital due to a unity of effort. From a staffing perspective, the effective management of funds could be effected by fleet consolidation as a greater number of staff per project would work towards very similar, if not common goals. Similarly, fewer projects would limit the chances of specification creep as fewer SORs would be required.

The trends in defence spending and procurement have largely remained unfavourable for the CAF throughout its existence. More recently, Industry Canada, Public Works and Government Services Canada (PWGSC) and DND have struggled to complete projects such as

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[43] Perry, "2015 Status Report on Major Defence Equipment Procurements," i.
[44] *Ibid*.
[45] Lagassé, "Recapitalizing the Canadian Forces' Major Fleets…," 9.
[46] Perry, "2015 Status Report on Major Defence Equipment Procurements," 20, 30.

that of the FWSAR procurement in a timely manner despite increased funding owing to the increased operational tempo associated with Canada's commitments in Afghanistan.[47] With the winding down of operations in Afghanistan, the Canadian defence budget has suffered cutbacks totalling more than 10 percent since 2010.[48] Without sustained budgetary growth, it appears as though Canada's adverse trends in spending and procurement will continue into the future.

In his mandate letter to the Minister of National Defence (MND), Prime Minister Trudeau has articulated his political strategy as "…growing [the Canadian] economy, strengthening the middle class, and helping those working hard to join it."[49] There was no mention of planned increases in defence spending, and similar to the 2013 Speech from the Throne calling for the renewal of the *Canada First Defence Strategy* (CFDS),[50] the mandate letter emphasized that a review of the "…now-outdated…" strategy is a priority for the Canadian government.[51] The broad missions of the CFDS were not characterized by cost-effectiveness,[52] and the announced defence review will likely focus the strategic demands of the CAF and associated levels of defence spending. Should the defence review result in a *White Paper* similar to that of Pierre Elliot Trudeau's Liberal government of 1971, it will mean significant cuts to the Canadian defence budget.[53] Possible reductions in future defence spending have also been signalled by the 2016 Budget announcement as $3.7B will no longer be available to DND for

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[47] Stone, "Improving the Acquisition Process in Canada," 1.
[48] Perry, "Doing Less with Less…", 3.
[49] Canada, Office of the Prime Minister, "Minister of National Defence Mandate Letter," accessed 09 April 2016. http://pm.gc.ca/eng/minister-national-defence-mandate-letter
[50] David Johnston, Speech from the Throne to open the Second Session 41st Parliament of Canada, Ottawa, 16 October 2013. http://www.pcobcp.gc.ca/index.asp?lang=eng&page=information&sub=publications&doc=aarchives/sft-ddt/2013-eng.htm
[51] Canada, Office of the Prime Minister, "Minister of National Defence Mandate Letter."
[52] Lagassé, "Recapitalizing the Canadian Forces' Major Fleets…," 9.
[53] "In the first four years of the Trudeau government, real defence expenditures declined by 7.5% and the capital portion of the budget declined to about 8%." Stone and Solomon, "Canadian Defence Policy and Spending," 152.

large-scale capital projects until 2022.[54] When the signals and announcements of today's government are compared with the past missteps in Canadian defence spending and procurement, it is clear that the RCAF of the future must be prepared to continue providing the same level of service to the government, albeit with less resources. Consequently, fleet rationalization must become a priority for the RCAF, and consolidation of its large fixed-wing platforms can provide an avenue for providing the same with less.

THE BENEFITS OF FLEET CONSOLIDATION

Notwithstanding the advantages that fleet rationalization can provide to alleviate the challenges linked to the Canadian military procurement processes, fleet rationalization in the RCAF can potentially mitigate the adverse consequences of limited defence spending by enhancing operational effectiveness through cost-saving measures. The concept can also serve as an instrument for breaking down the "stovepipes" which currently exist amongst the RCAF's fixed-wing transport fleets through shared knowledge in an effort to support the concept of increased 'airmindedness.'[55]

One method by which fleet rationalization would increase operational effectiveness is by reducing some of the training burdens currently suffered in the RCAF. Reduced training costs could translate directly to funds and flying hours to be used on operational missions. In their research for the RAND Corporation, Thomas Held, Bruce Newsome, and Mathew Lewis have advocated that the increased operational flexibility linked to reduced costs in training on

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[54] Amanda Connolly, "Feds punt DND procurement cash to 2022, acknowledge delays." *iPolitics*, 22 March 2016. http://www.cgai.ca/inthemediamarch222016b

[55] The RCAF's large fixed-wing platforms perform a wide range of operations. Airmindedness is derived from an appreciation of the various roles of the RCAF, and it provides the means of effectively understanding and applying air power. Christopher J. Coates, "Airmindedness: An Essential Element of Airpower," *The Royal Canadian Air Force Journal* 3, no. 1 (Winter 2014): 70. http://www.rcaf-arc.forces.gc.ca/assets/AIRFORCE_Internet/docs/en/cf-aerospace-warfare-centre/elibrary/journal/2014-vol3-iss1-08-airmindedness-an-essential-element-of-air-power.pdf

common platforms or components is well-understood in the world of commercial aviation.[56] Since it was founded, Airbus has made every effort to exploit commonality within its fleets, and fifteen of Airbus' aircraft models have nearly identical cockpits and similar handling characteristics.[57] By maximizing commonality Airbus has saved approximately 20-25% in aircrew training costs.[58] Southwest Airlines has taken the concept of component commonality even further, by deciding to operate a single-airframe fleet comprised of 704 Boeing 737s in an effort to reduce the required training of pilots, maintainers, and flight attendants.[59] In order to mitigate future reductions in the Canadian defence budget, the RCAF should strive to follow the business models currently observed by Airbus and Southwest Airlines.

Given the tempo of posting cycles within the RCAF, fleet consolidation can pointedly reduce training times and alleviate the non-specialized cross-training requirements of personnel on different platforms. Research conducted by the Chief Review Services (CRS) between March 2011 and February 2012 indicated that of the $365.65M allocated annually for the training of all RCAF trades, pilot training alone accounts for 89 percent of the total program cost.[60] As the largest consumer of RCAF training funds, cost savings in pilot training will significantly impact the RCAF's overall training bill. Aircrew training at the Occupational Training Unit (OTU) level generally demands several months where the duration of courses is determined by the range of

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[56] Thomas Held, Bruce Newsome, and Matthew W. Lewis, "Commonality in Military Equipment: A Framework to Improve Acquisition Decisions," *RAND Corporation*, (Santa Monica: 2008), 30. http://www.rand.org/content/dam/rand/pubs/monographs/2008/RAND_MG719.pdf

[57] Airbus, "Commonality," accessed 22 April 2016. http://www.airbus.com/aircraftfamilies/passengeraircraft/commonality/

[58] McManus, H. L., A. Haggerty, and E. Murman, "Lean Engineering: Doing the Right Thing Right," Proceedings of the 1st International Conference on Innovation and Integration in Aerospace Sciences, Queen's University Belfast, Northern Ireland, UK, August 2005, 6. https://dspace.mit.edu/bitstream/handle/1721.1/84165/CP_LeanEngineering.pdf?sequence=1

[59] Michael Treacy and Fred Wiersema, *The Discipline of Market Leaders: Choose Your Customers, Narrow Your Focus, Dominate Your Market* (Boston: Addison-Wesley Publishing, 1994), 51.

[60] Canada. National Defence and the Canadian Armed Forces. "Evaluation of Air Force Training and Readiness Part 1 – Air Force Initial Occupational Training." November 2012. Accessed 26 April 2016. http://www.crs-csex.forces.gc.ca/reports-rapports/2012/187p0940-eng.aspx#profile-of-air-force

skills, complexity, and knowledge required of the occupation.[61] At Occupational Training Squadrons (OTS) such as 426 Squadron (Sqn), aircrew training is phased beginning with an emphasis on core operational skills, or the basic flying abilities required to safely operate the associated platform. Specialized training on the platform type is then introduced pertaining to the role to be fulfilled. In the case of 426 Sqn, the specialized training on the CC-130J and CC-130H is associated with the tactical demands of the TAL role for the operators of 436 Sqn, and the SAR role for operators of 413, 424, and 435 Sqns. Given that fleet consolidation implies transferability of core skills between different platforms exercised in different roles, OTU training times could be considerably reduced by focusing only on the specialized training for aircrew being posted into a new role, although on the same platform. Furthermore, the reduced training bill in the RCAF would be compounded by a lessened requirement for training infrastructure. Fewer fleets would mean that fewer Training Establishments (TEs) would be required.[62] The cost savings associated with reduced TEs would also be supported by a lessened requirement for instructional positions, hence freeing up not only funds, but personnel for operational assignments.

The concept of fleet rationalization will further mitigate the RCAF burdens in training through simulation and can be aligned with the RCAF Simulation Strategy 2025 (RSS).[63] The newest fleets of the RCAF, namely those of the CC-130J and CH-147 are currently utilizing simulation to achieve more than 90 percent of their training requirements,[64] and the RSS will

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[61] *Ibid*.
[62] Held, Newsome, and Lewis, "Commonality in Military Equipment…", 22.
[63] The intent of the RSS is to "…optimize the means by which RCAF aviators achieve and maintain readiness, fully exploiting advances in both technology and training methodologies, to deliver world-class capabilities for the full spectrum of operations." Canada, Department of National Defence, "Executive Summary: RCAF Simulation Strategy 2025," Royal Canadian Air Force, last modified 12 March 2015, http://www.rcaf-arc.forces.gc.ca/en/news-template-standard.page?doc=executive-summary-rcaf-simulation-strategy-2025/i6mj0r6z
[64] Sonia Connock, "Embracing the Future: RCAF finds solutions in innovative training technologies," Department of National Defence, Royal Canadian Air Force, last modified 25 March 2014. http://www.rcaf-

likely continue with those models for aircrew training on future platforms. By virtue of the RSS, the RCAF plans to save approximately $2B over 20 years in Force Generation (FG) costs, save flying hours, and reduce the lengths of OTUs.[65] Simulation has become a priority for the RCAF, and rationalization of RCAF fleets will require fewer simulators to achieve its training goals. By examining the relationship between fleet rationalization and the RSS, it is clear that the savings in time, personnel, and cost could then be shifted to real-world operations, hence increasing the RCAF's operational flexibility.

Notwithstanding the savings associated with the RCAF's training bill, the reduction of logistical burdens by fleet consolidation can incur greater savings and increase operational flexibility. The RCAF currently employs eight operational fleets in its large fixed-wing communities,[66] and each fleet requires stores for their differing replacement components. In their analysis of the advantages of component commonality, innovation experts Karl Ulrich and David Robertson have highlighted that the sharing of components between fleets can greatly reduce replacement part stock requirements in terms of both number of replacement parts and storage infrastructure.[67] Given the vastness of Canada and the dispersal of RCAF air wings across the country, one might think that this benefit would be negated; however, it is important to emphasize that the majority of the RCAF's large fixed-wing platforms share their base

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arc.forces.gc.ca/en/news-template-standard.page?doc=embracing-the-future-rcaf-finds-solutions-in-innovative-training-technologies/ht8s3wor

[65] By not relying on actual airframes for training, the CH149 fleet has reduced its first officer initial course from 16 to 10 weeks. Canada, Department of National Defence, "Executive Summary: RCAF Simulation Strategy 2025"

[66] The fleets are comprised of the CC-115 Buffalo, CC-138 Twin Otter, CC-130H Hercules, CC-130J Hercules, CC-150 Polaris, CC-144 Challenger, CC-177 Globemaster III, and CP-140 Aurora.
Canada, Royal Canadian Air Force, "Aircraft," accessed 29 April 2016. http://www.rcaf-arc.forces.gc.ca/en/aircraft.page

[67] David Robertson and Karl Ulrich, "Planning for Product Platforms," *Sloan Management Review,* Vol. 39, No. 4 (Summer 1998): 23. http://sloanreview.mit.edu/article/planning-for-product-platforms/

infrastructure in 8 Wing Trenton, 14 Wing Greenwood, and 19 Wing Comox.[68] In their research for the USAF's Project Air Force, Victoria Greenfield and David Persslen found that the cost effectiveness of air force operations is effectively driven by the operations and maintenance (O&M) costs over the life-cycle of a given platform, and that "…the [fiscal] consequences of replacing too late are less severe than replacing too soon."[69] Their research was supported by the findings of the United States General Accounting Office which reported that approximately 72 percent of the cost of platform ownership is generated by O&M.[70] The RCAF has embraced this concept, as indicated by extensions in the estimated life expectancies (ELE) of the CC-138, CC-130, and CP-140 fleets.[71] Therefore, given the longevity of RCAF platforms, the stocking of replacement components has a large role to play in the RCAF, and the savings based on part commonality can be significant. Consequently, operational flexibility can be increased by translating the cost savings associated with the logistical burdens of the RCAF to other operations.

Component commonality does not only invite cost-savings, but the operational effectiveness of consolidated platforms is driven by shared capabilities.[72] When analyzing mixed

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[68] In terms of fixed-wing communities, 8 Wing Trenton is shared by the CC-130H, CC-130J, CC-177, and CC-150; 14 Wing Greenwood is shared by the CC-130H and CP-140; and 19 Wing Comox is shared by the CC-115 and CP-140. The CC-130Hs of Winnipeg, CC-138s of Yellowknife, and the CC-144 of Ottawa are the exceptions in terms of sharing air wings.
Canada, Royal Canadian Air Force, "Wings and Squadrons," accessed 29 April 2016. http://www.rcaf-arc.forces.gc.ca/en/wings-squadrons.page

[69] Victoria A. Greenfield and David M. Persslen, *An Economic Framework for Evaluating Military Aircraft Replacement*, Report prepared for the United States Air Force (Santa Monica: RAND, 2002), 11.

[70] United States, General Accounting Office, *Defense Acquisitions: Air Force Operating and Support Cost Reductions Need Higher Priority*. (Washington: United States General Accounting Office, 2000), 6. http://www.gao.gov/assets/230/229488.pdf

[71] Canada. Royal Canadian Air Force. "Estimated Life Expectancy: ELE and the RCAF." 06 March 2015. http://www.rcaf-arc.forces.gc.ca/en/news-template-standard.page?doc=estimated-life-expectancy-ele-and-the-rcaf/i6miz740 Furthermore, all RCAF CC-130Es were retired after operating for more than 40,000 flying hours. Defense Industry Daily Staff, "Replacing Canada's Failing CC-130s: 17 CC-130Js," *Defense Industry Daily*, 31 July 2014, accessed 15 April 2016. http://www.defenseindustrydaily.com/canadas-cc130s-to-fail-in-3-years-4b-rfp-for-replacements-updated-01529/

[72] Held, Newsome, and Lewis, "Commonality in Military Equipment…", xii.

fleet options for the CF-18 replacement project, Defence Research and Development Canada (DRDC) found that mixed fleets of the same number of aircraft would likely incur higher costs while lowering the overall capability.[73] DRDC's findings could also apply to the RCAF's large fixed-wing fleets, and fleet consolidation could improve mission effectiveness through the operational availability of platforms for other roles. Serviceability rates would likely remain unaffected, but common platforms may have the flexibility to be re-configured or re-assigned to a given task**.** For example, an unserviceable FWSAR asset at 8 Wing Trenton could potentially be replaced in short order by a TAL asset if the fleets were consolidated. Operational flexibility is an inherent trait of fleet rationalization, and this is an important aspect to consider as the commitments of the RCAF could be fulfilled by fewer platforms.

While operational flexibility and cost savings remain central tenants of fleet rationalization, the concept of improving airmindedness in the RCAF is equally applicable. Dr. Allan English and Col (retired) John Westrop have noted that the "problems in air force leadership and command have been attributed to 'stovepipes' in which many air force personnel find themselves for much of their careers."[74] The stovepipes can be explained by the dissimilar roles and equipment of each RCAF community.[75] Fleet consolidation can be an instrument for merging these stovepipes through shared knowledge, and as Dr. John Girard has opined "knowledge will be the ammunition of choice for Canada's future military forces."[76] As the

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[73] Sean Bourdon and Gregory Hunter, "A Comparative Analysis of Minimum Resource Requirements for Single and Mixed Fleets for the National Fighter Procurement Evaluation of Options," Defence Research and Development Canada, accessed 08 April 2016, 1. http://www.forces.gc.ca/assets/FORCES_Internet/docs/en/about-reports-pubs/06%2005%20Mixed%20Fleet%20(En)%20-%20final.pdf

[74] Allan English and John Westrop, *Canadian Air Force Leadership and Command: The Human Dimension of Expeditionary Air Force Operations* (Kingston: DND, 2007), 156.

[75] *Ibid*.

[76] John Girard, "Canadian Defence Knowledge Management," *The Public Management of Defence in Canada*, edited by Craig Stone (Toronto: Breakout Educational Network, 2009), 195.

RCAF strives to promote its concept of AIRPower,[77] the commander of the RCAF, Lieutenant-General (LGen) Hood has stated that one of his focuses is the intellectual development of officers and non-commissioned members who will ensure that the RCAF operates as an integrated organization.[78] Through shared knowledge, fleet rationalization could have a significant influence on the achievement of RCAF goals related to integration and airmindedness.

The higher degree of interoperability from fleet rationalization equates to greater sharing of knowledge between RCAF large fixed-wing communities. On a grander scale, the RCAF has embraced this concept by participating in the Joint Users Group (JUG) for the CC-130J and the Globemaster Integrated Sustainment Program (GISP) for the CC-177. [79,80] The purposes of the JUG and GISP are to promote the sharing of knowledge between nations which operate common equipment in similar roles. If fleet consolidation were to be refined in the RCAF's large fixed-wing communities, similar efforts would yield parallel results in terms of information sharing. If a similar forum to the JUG or GISP was created within the RCAF, common practices pertaining to maintenance, training, and implications of operating environments would be discussed regularly, leading to a better understanding of each community's roles and responsibilities.

The information sharing between communities would also result in an environment which is more congruent with aviation safety. One manner in which this would occur would be through the RCAF's existing flight safety program. The program's information output would be

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[77] AIRPower is the concept being promoted by the RCAF of an Agile and Integrated air force with the Reach and Power to successfully conduct operations.

[78] Ryan Melanson, "AIRPower in Formation: RCAF commander brings his message to the East Coast," Royal Canadian Air Force, last modified 01 February 2016, http://www.rcaf-arc.forces.gc.ca/en/news-template-standard.page?doc=airpower-in-formation-rcaf-commander-brings-his-message-to-east-coast/ijzbn7zw

[79] Julian Kerr, "Maintenance & Upgrades: C-130J Block Upgrades Extend Capability," *Australian Defence Magazine*, 01 August 2011. http://www.australiandefence.com.au/archive/maintenance-and-upgrades-c-130j-block-upgrades-extend-capability-adm-august-2011

[80] Martin Shadwick, "How Much Strategic Airlift is Enough?" *Canadian Military Journal* 13, no. 3 (Summer 2013): 77. http://www.journal.forces.gc.ca/vol13/no3/doc/Shadwick-Pages7679-eng.pdf

more readily absorbed in differing stovepipes due to platform commonality. The effectiveness of the program is driven by the free sharing of safety information,[81] and collective outputs linked to common platforms would result in an environment where differing communities could gain a greater understanding of safety culture within the RCAF. Aircrew and maintainers could also carry their safe operating practices with them on postings to communities operating common platforms. Dr. Bruce Bell, Charles Robertson and Gregory Wagner have completed a study on the prediction aviation safety behaviour and found that flight experience in terms of flying hours, ratings, and malfunction histories have negligible effects on safety behaviour when compared with the certificate duration of the aircrew.[82] English and Westrop have highlighted that "there are challenges inherent in the diversity of fleets and roles that affect training, operations and career progression,"[83] and for many aircrew, the cross-training associated with shifting communities remains a strong deterrent for postings. Therefore, by negating the need for full OTUs when posted to different communities, fleet consolidation could mean that RCAF aircrew would retain their flying categories for a longer period. The length of time that an aircrew member is employed in a flying role yields significant results in terms of safety behaviour and by traversing stovepipes with common aircraft, posted aircrew members will enhance the flight safety culture of the RCAF.

There are many benefits associated with the concept of fleet consolidation. The cost-savings, operational flexibility and promotion of airmindedness all support the notion that the RCAF could provide at least an equivalent level of service to the government of Canada with

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[81] Canada, Royal Canadian Air Force, "Flight Safety," accessed 11 April 2016. http://www.rcaf-arc.forces.gc.ca/en/flight-safety/index.page

[82] Bill Bell, Charles Robertson, and Gregory Wagner, "Aviation Safety as a Function of Pilot Experience: Rationale or Rationalization?" *Journal of Aviation/Aerospace Education & Research* 5, no. 3 (Spring 1995): 6, 10.

[83] English and Westrop, *Canadian Air Force Leadership and Command…*, 190.

less funding. To put the advantages in perspective, opportunities for fleet consolidation in today's RCAF must be highlighted.

OPPORTUNITIES FOR THE RCAF'S LARGE FIXED-WING FLEETS

By virtue of the benefits associated with fleet consolidation, it is clear that the RCAF must strive to reduce the number of its large fixed-wing fleets in order to achieve the same with less. The key to the concept is the notion that the gains from fleet consolidation must outweigh any capability losses associated with abandoning different platforms.[84] In addition, excess functionality can unnecessarily increase the procurement and operating costs of the RCAF.[85] It is for this reason that every role of the RCAF large fixed-wing fleets cannot be fulfilled by a single platform. Instead, the RCAF must consider merging communities which rely on similar costs and performance specifications into fewer fleets.

In order to highlight those fleets which would benefit from fleet consolidation, it is important to weigh the capabilities currently provided by the fleet with their operating costs. According to the *Cost Factors Manual 2014-2015*, DND has calculated the estimated costs per flying hour for all RCAF platforms,[86] and in the large fixed-wing platforms there are similarities which must be considered. The fleets can be divided into three distinct pools based on total operating costs. The cheapest pool is comprised of the CC-138, and the CC-144, although the costs associated with the capabilities of the CC-138 only amount to 37 percent to those of the CC-144. The CC-115, CC-130H, CC-130J, and CP-140 represent the intermediary pool. Finally, the costs associated with the CC-177 and CC-150 represent the highest costs of the three, but are

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[84] Robertson and Ulrich, "Planning for Product Platforms," 22. For example, the CC-138 cannot fulfill the roles of the CC-177 in a cost effective manner.
[85] Held, Newsome, and Lewis, "Commonality in Military Equipment…", xii.
[86] The estimated costs per flying hour were based on the 2014-15 Total Air Resource Management (TARM) at a flying rate of 95 percent. These operating costs were based on Aviation Petroleum, Oil and Lubricants (AvPOL) consumption, O&M, and National Procurement (NP) costs. Canada. Department of National Defence. *Cost Factors Manual 2014-2015 Vol. II – Equipment and Facility Costs* (Ottawa: 2014), 1.

comparable.[87] Notwithstanding the vast differences between the CC-138 and CC-144, it is not surprising that the other pools are each comprised of aircraft sharing similar size and performance specifications. Using the total operating costs as a benchmark for RCAF capabilities, the previously highlighted benefits can be applied.

The CC-138 provides a very specialized set of capabilities for the RCAF, and is by far the cheapest platform to operate. It would be difficult to merge the capabilities of the CC-38 and CC-144, and for this reason, the pool comprised of the lowest cost platforms would not represent a good candidate for platform consolidation. On the other hand, there are significant advantages to be gained by fleet consolidation in the other two pools. Using the CC-130J as an example in the intermediary pool, it could fulfill the FWSAR, TAL, AAR (KC-130J), and LRP (SC-130J) roles of the other platforms given equivalent operating costs.[88] Similarly, the TAL, STRAT, and AAR capabilities of the CC-177 and CC-150 could be met by a common platform in order to reap the benefits of platform consolidation. If produced, a CC-177 variant capable of AAR would be an example of one such platform.[89] When weighing the costs of RCAF capabilities with the current fleet disposition, the RCAF would be able to provide the same level of service with four large fixed-wing fleets, as opposed to the eight currently in operation.

CONCLUSION

In order to address the unfavourable trends in Canadian defence spending and military procurement, the RCAF should consider refining the concept of fleet rationalization in its large fixed-wing fleets. This paper began by discussing the roots of the challenges in defence spending

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[87] CC138: $1950/hr, CC-144: $5250/hr, CC-115: $11,300/hr, CC-130H: $13350/hr, CC-130J: $20,750/hr, CP-140:$19,750/hr, CC-177: $21,350/hr, and CC-150: $17,150/hr.
Ibid., 4.
[88] Lockheed Martin, "C-130J Super Hercules," accessed 29 April 2016. http://lockheedmartin.com/us/products/c130.html
[89] Guy Norris, "MDC Reveals KC-17 Cargo/Tanker Details," *Flightglobal*, 18 September 1996. https://www.flightglobal.com/news/articles/mdc-reveals-kc-17-cargotanker-details-11685/

and procurement in Canada, and how similar trends have been carried to this day. The signals generated by Justin Trudeau's Liberal government have indicated that the unpromising trends in defence spending and procurement will likely continue in the near future. Next, this paper highlighted how the concept of fleet consolidation can be applied in order to mitigate the effects of limited defence spending while maintaining current capabilities. This was achieved by examining the relationship between the cost-saving measures associated with fleet consolidation and their translation to operational effectiveness and flexibility. Finally, it briefly examined some opportunities for fleet consolidation in the RCAF's large-fixed wing fleets. This was accomplished by comparing the operational costs with the capabilities currently provided, and concluded that eight operational fleets could be consolidated into four given similar operating costs in order to benefit from fleet consolidation.

Perhaps the current government's announcement detailing the shift of capital projects to the 2022 timeframe could provide the RCAF with the time for a much-needed opportunity to re-assess the manner in which it currently provides the same level of capability with less funding. Fleet consolidation in the RCAF's large fixed-wing communities represents a potential solution to the problem, and should be strongly considered by DND and the Government of Canada in the near future. In order to maintain a relevant, responsive, and effective, the RCAF must strive to accomplish the same with less by virtue of fleet rationalization.

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