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SEPARATED PROCUREMENT: RE-THINKING THE AIRBORNE PLATFORM

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AIM

1. This paper proposes a modernized approach to developing airborne capabilities, by divorcing the acquisition of air vehicles and their mission payloads. The intent is to overcome the challenges of procurement and technological acceleration in order to maintain capable, relevant military air forces. This could realistically be applied to any capability where platform performance is not a core mission requirement: it is not proposed as a universal solution for all air force roles. Nonetheless there are considerable advantages to adopting such an approach, which this paper will explore. This is intended strictly as a concept analysis: detailed metrics like costs, person-years (PY), and timelines are beyond its scope and are thus addressed in general terms.

INTRODUCTION

Assumptions and Challenges.

2. In the Horizon One time frame (1-5 years), it is assumed that force generation will continue struggling to meet the Royal Canadian Air Force (RCAF)'s personnel requirements.[1] Should aggressive recruiting and retention initiatives succeed; the limited availability of experienced trainers will impair the RCAF's capacity to reconstitute its

[1]House of Commons Standing Committee on Public Accounts, "Report 5—Canadian Armed Forces Recruitment and Retention - National Defence," *Fall 2016 Reports of the Auditor General of Canada* (Ottawa: Government of Canada, 2017), 2.

human capital. However air power will continue to be a tool of first resort when Canadian leadership feels compelled to take visible, decisive action in response to global events.

3. Within Horizon Two (5-10 years), manned aircraft will remain the dominant means of air power delivery; however the civil aviation industry will lead automation efforts in response to chronic pilot shortages.[2] The political and private sector temptation to interfere with lucrative procurement projects will likely continue to prove too powerful to resist. This would engender a risk-averse culture in procurement. Commercial technology will outpace military advancement across a widening array of sectors, while sensors, weapons, and other payloads will modernize increasingly faster than the platforms that carry them. Adversaries, unencumbered by institutional constraints, will also innovate more rapidly.

4. By Horizon Three (10-30 years), new platforms will have begun to create leaps in capability. Ultra-high performance, autonomy, and versatility will eclipse legacy platform capacity.[3] Advancements in design and information processing will outstrip the capability development cycle currently used by the RCAF: human capacity, not technology, will become the key limitation of weapons systems.

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[2]Jon Ostrower and Andy Pasztor, "Single-Pilot Cockpit Idea Floated in NASA Study; New Study Comes as Industry Faces Potential Pilot Shortage and Dramatic Advances in Automation," *Wall Street Journal (Online),* last accessed 28 January 2018. https://search.proquest.com/docview/1636012315?accountid=9867.

[3]Department of National Defence, *Projecting Power: Canada's Air Force 2035* (Ottawa: DND Canada, 2009), 12.

Issue

5. The combination of these factors will result in the RCAF incrementally losing the ability to keep abreast of developments if legacy procurement practices are maintained.[4] In order to build organizational agility and sustain a technological edge, the RCAF must change its approach to the acquisition of future capabilities.[5]

DISCUSSION

Definitions.

6. For purposes of this discussion, the term "platform" is used generically to describe any air vehicle capable of supporting and operating a mission system. This refers mainly to fixed- and rotary-wing aircraft, but it is equally applicable to balloons, rockets, and any more exotic vehicles that may eventually be produced.

7. A "mission system" refers to the equipment installed in, mounted on, or carried by the platform to execute its task. This can include data link, sensors, emitters, and data processing systems, as well as fire-control systems, weapons, and other air-launched stores. Operator work stations can also be considered as part of the mission system, as they form the interface between the platform's crew and equipment. Navigation and communications systems can be thought of interchangeably between the two categories: a

[4]Department of National Defence, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa: DND Canada, 2017), 74.

[5]Department of National Defence, *Air Force Vectors* (Ottawa: DND Canada, 2014), 34; Alberts, David S. "Agility, Focus, and Convergence: the future of command and control." *The International C2 Journal* 1, no. 1 (2007): 23; Department of National Defence, *Strong, Secure, Engaged…*, 74.

good example is a multi-band aircraft radio, which can be used for tactical communications as well as routine safety and navigation purposes.[6]

8. The term "separated procurement" (SP) has been selected to refer to the practice of acquiring mission systems and platforms independently of one another. Any of a number of terms would be suitable to describe SP, but this will be used for consistency.

Concept.

9. One effective way of addressing this is to split the procurement of airborne platforms and missions systems into two separate processes entirely. Separated procurement (SP) is not revolutionary; it is simply an evolution of the existing practice of building multi-role aircraft.

10. The F/A/E-18 Super Hornet is an example of a multi-role aircraft, pre-configured with onboard systems for conversion to an electronic warfare (EW) role if required. The P-8 Poseidon is another multi-mission aircraft, built with additional onboard space for future expansion. The RCAF presently sustains a multi-role capability by upgrading mission systems on purpose-built aircraft like the CP140 Aurora or CF188 Hornet.

[6]Rockwell Collins, "AN/ARC-210 Gen5 Programmable Digital Communication System: The airborne V/UHF software defined radio of choice by the U.S. Dept. of Defense," last accessed 1 February 2018, https://www.rockwellcollins.com/Products_and_Services/Defense/Communications/Airborne_Communications/VHF_UHF_L-Band/AN-ARC-210_Gen5_programmable_digital_communication_system.aspx.

11. There are already early exemplars of SP platforms whose development has evolved beyond a multi-role concept, like the C-12 King Air. These are low-cost commercial airframes modified with sensors, communications equipment, and other systems to perform a wide variety of military and civil government missions.[7] These aircraft are heavily used in specialized ISR roles in a number of theatres, for which specific equipment is installed. New and updated variants are produced as requirements arise, such that there are roughly 30 different ISR configurations of the C-12 in existence today.[8]

12. The examples given are all based on proven airframe designs, some over half a century old. Yet all of these platforms employ cutting-edge mission systems that have been extensively modernized. However the practice of maintaining multi-role platforms as stand-alone capabilities is costly, difficult, and time-intensive, and risks becoming unsustainable. The RCAF's efforts to modernize the CP140 for operations illustrate the limitations of what can be achieved with its modest resources.[9]

13. Rather than focusing on a specified role, an SP platform would instead become a generic template for mounting mission systems. It would be designed with internal equipment

[7]Geoff Fine, "CANSEC 2014: Boeing offers RAMIS for possible Canadian ISR effort," *Jane's Defence Weekly*, last modified 2 June 2014, https://janes.ihs.com/InternationalDefenceReview/DisplayFile/idr16696?edition=2014; L3 Aerospace Systems Press Release, "L3 to provide proven solution for MAISR program," *Skies*, last modified 7 February 2017, https://www.skiesmag.com/press-releases/l3-provide-proven-solution-maisr-program/.

[8]Paul Jackson, ed., *IHS Jane's All the World's Aircraft, Development and Production 2015-2016*, "Beechcraft King Air," 693-702.

[9]Ernest Cable, "Canadian Maritime Aviation: Requiem or Renaissance?" *Canadian Defence Quarterly* 27, no. 4 (Summer 1998): 15. https://search.proquest.com/docview/197161525?accountid=9867.

racks, data buses, plumbing, and power supplies; and external mounting points for sensors, antennae, pods, and weapons. Platforms could be adapted from existing designs in many cases; however specialized vehicles would become viable were SP practices adopted widely enough. Aerostats, stratospheric drones, and miniature swarm vehicles are examples of promising future platform development.

14. The parameters of these platforms would need heavily standardized "open architecture", an evolution of the military specifications, interoperability agreements, and civilian aviation standards already used. A civilian example of this principle in practice is the Airbus design model, where flight decks are designed with a high degree of commonality across aircraft types. SP mission systems would be designed for this standard architecture and acquired for a particular role, with components replaced as new technology develops.

15. Separated procurement could feasibly be adopted anywhere that a mission is not reliant on specialized platform performance. Examples include search and rescue (SAR), intelligence surveillance and reconnaissance (ISR), and air mobility. Carefully-designed platforms could excel in electronic warfare (EW), air to air refueling (AAR), close air support (CAS), and anti-submarine warfare (ASW) roles, possibly all using the same airframe.[10] General-purpose SP platforms would be less suitable for environments

[10]Jim Dorschner, "In Search of an ISR/Strike Bargain," *Jane's Defence Weekly*, last modified 27 June 2014, http://janes.ihs.com/DefenceWeekly/DisplayFile/jdw55746?edition=2014.

requiring specialization to survive, such as threat airspace or corrosive seawater, but the same principles could still be applied to the design of these platforms.

Advantages.

16. A key benefit of SP would be a reduction in resource requirements, including human resources. Considerable work could be outsourced to civilian contractors for many missions, giving the RCAF some freedom to generate the increased forces required.[11] Contracted civilian personnel have already been involved in manned and unmanned ISR, strategic AAR operations, rotary-wing SAR, and training operations with varying degrees of success across the RCAF. The best practices derived from these initiatives provide a basis of corporate knowledge needed to expand this into other areas where needed.

17. Civilians could further augment strategic air mobility, rotary-wing utility, AAR, SAR, and many ISR operations. Civil-type platforms, crewed by military personnel and modified to SP specifications, could execute aerospace control and maritime functions. Increased civilian maintenance support could be employed for almost any RCAF capability outside of high-threat areas.

18. Separated procurement would also bring benefits to training. By adopting universal standards across a smaller number of platforms, schools could combine common training

[11]Department of National Defence, *Strong, Secure, Engaged…*, 39.

elements into lower-level courses and accelerate throughput. Crewing, maintenance, and support could all be reduced by fielding simplified common systems.

19. Fiscal resources would be optimized under SP. It is likely that manufacturers would initially need to modify existing designs in order to accommodate truly open systems architecture, which could increase initial costs. However this would be offset by building each platform for a broader set of missions, widening the pool of available buyers. Additional economy is possible by offering SP platforms to civilian operators and allied forces. It could also become possible to lease certain platforms, a model used by many airlines to control operating costs.[12]

20. SP could be made attractive to vendors if a manufacturer could market a single platform for multiple applications. It would lower barriers to new entrants, allowing small innovative companies to compete with established giants. Expertise developed in retrofitting existing airframes to SP specifications could be used to develop new categories of platforms, potentially creating a new sector in the aerospace industry.

21. For project managers, SP could eliminate the need to replace platforms as mission systems become obsolete or costly to maintain. Platforms like the Boeing 707 have proven that they can outlast multiple generations of technology and remain operationally

[12]The Economist Group Limited, "Aircraft Leasing: Buy or Rent?" *The Economist*, last modified 21 January 2012, http://www.economist.com/node/21543195.

relevant.[13] Resources could instead be directed towards better missions systems, where need, cost and volatility are highest. SP could eliminate the need for "configuration freezes", enabling continuous updates for rapidly-evolving missions like EW or signals intelligence (SIGINT).

22. Operationally, SP would offer commanders considerable flexibility. Capabilities could be "re-roled" more rapidly when requirements changed, particularly for missions with common elements of training. Many RCAF fleets train multi-role crews, so the human resources basis for this capacity already exists. Fleets of leased platforms could expand or contract quickly as requirements changed, reducing the need to continuously maintain RCAF inventory at full combat strength. Large platforms could field several mission systems at once, optimizing use of assets. Interoperability, a key requirement for joint and combined operations, would be enhanced if platforms, processes, and systems were designed to common international standards.

Implications

23. Separated procurement is expected to reduce demand for operations and maintenance resources; however this could increase demand for force development. SP systems would

[13] Jean R. Gebman, *Challenges and Issues with the Further Aging of U.S. Air Force Aircraft: Policy Options for Effective Life-Cycle Management of Resources* (Santa Monica, CA: RAND Corporation, 2009), 12. https://www.rand.org/pubs/technical_reports/TR560.html.

likely require more testing and evaluation for example, requiring allocation of more resources to RCAF force development units.

24. By splitting the acquisition of capabilities into separate streams, a single point for integrating the platform and its missions systems may no longer exist. As technology becomes more complex, such integration becomes increasingly vital. This has historically been a function of Project Management Offices (PMO): a new SP management process would be needed to mitigate this change.

    a. Separate PMO could manage platforms and mission systems, increasing efficiency by allowing multiple mission systems to be managed for a single platform. The challenges of coordinating this would be formidable however, particularly for highly integrated systems. This concept could offer savings for the management of simpler capabilities like SAR, AAR, and air mobility.

    b. Alternatively, integrated PMO for multiple capabilities could operate as one large organization to oversee all aspects of each program. This approach would be challenging and complex. It could be valuable for the integration of complex systems, such as those that employ weapons, but would require considerable specialized personnel to succeed.

    c. To alleviate this, a separate organization could integrate mission systems before contact with the platform. If platforms were sufficiently standardized, such integration should become easier as computer modelling and simulation improve.

This role could be assumed by civilian industry, much as a prime contractor integrates systems in projects today. This can entail risk, as the CH148 Cyclone experience shows, and would demand vigilant oversight. Increased competition under new free trade agreements suggests some promise, although Canadian procurement has a strongly protectionist history.[14]

RECOMMENDATIONS

25. Civilian technological development is now leading military advancement. The RCAF can benefit from this by adapting civil technologies to military use, instead of developing costly bespoke solutions. Developing universal standards and specifications for air platforms and systems would be the best way to do steer civilian technological development, and offers mutual benefit. Even if an SP initiative fails, robust standards would make a lasting and valuable contribution to industrial development.

26. Standards could be built upon existing North Atlantic Treaty Organization (NATO) agreements, International Civil Aviation Organization (ICAO), International Standards Organization (ISO), and military specifications (MILSPEC). Military standardization fora like the Multinational Interoperability Council already exist, where Canada could take a

[14]Arie Reich, "On Procurement, Protectionism and Protests: A Survey among Canadian Procurement Officers," *Canadian Business Law Journal* 23, no. 1 (February, 1994): 113-115.

lead in the Concept Development Working Group.[15] The private sector should be included as a stakeholder in this process, albeit without making it so large as to become ineffective.

27. The RCAF's capacity to integrate evolving mission systems is limited. This capacity should be expanded, preferably with reliable private sector partners to limit manpower impact and retain knowledge. RCAF testing and evaluation capacity will likely need to be increased, and the restructuring of project management organizations along SP principles should be explored.

28. A commercial off the shelf (COTS) prototype should be built to create and refine SP principles. Given the imminent age-out of several large airframes, an opportune starting point would be a platform capable of AAR, strategic airlift, ISR, and aerospace control missions. Best practices developed here could be formalized into RCAF procurement processes and shared with allies.

CONCLUSION

29. The RCAF's capability development process is being overcome by forces of technology, cost, and procurement interference beyond its control. As the global pace of change

[15]William Lewis, "Multinational Interoperability Council and Coalition Building," *The Canadian Air Force Journal* 2, no. 2 (Spring 2009): 31. http://airforceapp.forces.gc.ca/CFAWC/eLibrary/Journal/Vol2-2009/Iss2-Spring/Sections/05-Multinational_Interoperability_Council_and_Coalition_Building_e.pdf.

accelerates, organizational rigidity will further threaten the RCAF's capacity to remain operationally relevant.

30. Divorcing the acquisition of platforms and systems offers one promising way to build the agility needed to meet these future challenges. This is recognized in some quarters, and basic SP platforms are already flying missions today. More detailed analysis will be required to determine which capabilities would most benefit from SP. Case studies of the Multi-Intelligence Airborne ISR (MAISR) and F-35 Lightning programs are suggested as useful starting points for analysis. This evolution could be put into practice in Canada by adapting a large civilian-based testbed as the first purpose-built SP platform.

31. If SP standards and practices become widespread and achieve enough "market penetration", there is potential to revolutionize segments of the aerospace industry. Manufacturers building to widely-accepted standards could expand into new technologies without requiring costly government subsidies to underwrite risks. This self-reinforcing effect would in turn create new capabilities for the air force of the future. Separated procurement offers a compelling case for standardizing air systems to an extent never yet attempted, and creates an opportunity for Canada's Air Force to take a leadership role.

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