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TILT ROTOR TECHNOLOGY: RCAF TAKE NOTICE

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AIM

1. This paper is intended for consideration by the Director General Air Force Development (DG Air FD). The aim of this paper is to highlight several Royal Canadian Air Force (RCAF) capability gaps and recommend that the RCAF investigate the latest tilt rotor technology to provide an economical single-platform multi-functional solution. There remains ample opportunity for a private/public collaborative approach to technology development. Such opportunity should be explored in conjunction with recommendations herein but are outside the scope of this paper.

INTRODUCTION

2. Canada has traditionally purchased multi-role aircraft capable of performing various roles while maintaining central asset control and a narrow, cost-effective support tail. The C-130J Hercules, CF-118 Hornet and CH-146 Griffon are excellent examples of this approach. At the same time, procurement of single-use aircraft such as the CT-142 Dash 8, CH-149 Cormorant and CH-148 Cyclone have bucked this trend and offered the RCAF little multi-role value and less economy of scale.

3. The United States Army UH-60 Blackhawk replacement program, the Army's Future Vertical Lift (FVL) program, is driving a technology race that Canada may be able to leverage. In response to a new Army requirement for the winning platform to travel at 230 knots or greater, Bell and Lockheed Martin, are developing the V-280 Valor, a multi-role third-generation tilt rotor technology demonstrator aircraft that has the potential to fulfill many of Canada's future needs. At the same time, Augusta-Westland is very close to bringing their new AW609 tilt rotor

aircraft to the commercial market proving tilt rotor technology may finally be mature enough to become a reasonable consideration.

DISCUSSION

4. Canada currently has several critical capability gaps as a result of RCAF aircraft limitations, previous procurement decisions, and public policy. Canada has yet to commit sufficient search and rescue (SAR) resources to Northern Canada in order to maintain even a basic level of SAR capability. For years, Canadian Army (CA) soldiers have longed for attack helicopters as well as more capable vertical lift,[1] especially useful in Counter Insurgency (COIN) operations. Canada is also lacking a tactical medical evacuation (medevac) capability decreasing our troops' likelihood of survival in combat. Lastly, while Canada has grown its special operations forces (SOF), it has not committed a medium-range high-speed insertion and extraction capability to the force.

Multi-role Solution

5. The V-280 technology demonstrator has the potential to fill all the previously identified gaps with one single and ideally suited platform. It's expected to travel up to 560km/h, it will be strategically self-deployable with a range of over 3,900 km, it will be designed to operate in high and hot conditions (6000 ft at 95F hover), and will be able to carry 14 troops in addition to a four member crew.[2] The new aircraft will also come with a suite of sensors including Electro-Optic/Infra-Red (EO/IR) capabilities; again, his is a capability is looking for from the RCAF in

[1] Lieutenant-General P.J. Devlin, *Army Requirement for Tactical Aviation Support* (Commander Canadian Army, National Defence Headquarters: file 3183-1 (DLFD 3)) 13 April 2012.

[2] Bell Helicopter V-280 Valor, last modified [or accessed] 7 February 2016, http://www.bellhelicopter.com/military/bell-v-280

tactical air mobility.[3] Beyond offering substantially increased speed, range and payload over conventional similarly-sized helicopters, Bell is focused on vastly improving this tilt rotor's sustainability, reliability and affordability over the second-generation mass produced large tilt rotor, the V-22 Osprey.

Economic Benefits

6. Purchasing one strong tilt rotor platform that can provide multiple capabilities, is cost effective and can add minimal-compromise capability to the Canadian Armed Forces (CAF). The FVL competition target cost for the new tilt rotor will be similar or less than the UH-60 Blackhawk, putting it well within range of RCAF's funding capability if the CA, SOF and OGDs support the capital and ongoing costs of the program. By purchasing a multi-role vehicle, economies can be gained in maintaining one parts supply chain, one maintenance technician training program, one operational training unit (OTU) for aircrew training, and one engineering and life-cycle management network. Following general OTU training, aircrews and technicians can receive role/type-specific training at their operational units, which will have enhanced training cells dedicated to standards and readiness similar to existing establishments. In-service support models can be explored but is beyond the scope of this paper. Savings through economies of scale will enhance this program's attractiveness**.**

Northern SAR

7. In accordance with Canadian Forces Aerospace Move doctrine, rapid response is the most essential characteristic of SAR.[4] Move doctrine also goes on to say that the capability to

[3] Lieutenant-General P.J. Devlin, *Army Requirement for Tactical Aviation Support,* 13 April 2012.

[4] Department of National Defence (DND), B-GA-404-000/FP-001, *Canadian Forces Aerospace Move Doctrine* (Winnipeg: Canadian Forces Aerospace Warfare Centre, 2011), 49.

stay over a search area for an extended period of time is essential.[5] Canada's northern area of responsibility for SAR is massive. Much of Canada's area of responsibility is far north and out of reach of any rotary-winged assets but much of it would be within reach of a tilt rotor with minimal requirements for refuel if a small squadron of tilt rotors were stationed in Yellowknife. The Valor can fly much faster and more than three times as far with almost double the payload as the RCAF Twin Otters currently stationed in Yellowknife without refueling; once on station it will have the capability to land or hoist anywhere in the north. Stationing the tilt rotor in a small temporary operating location in the north such as Cambridge Bay during the summer months will also add both security and safety to the busy summer shipping season of the future. The new tilt rotor's EO/IR suite will also enhance its capability in the north, being able to search in all-weather, monitor ship traffic, and add an additional surveillance capability currently only available from CP-140 assets far away. None of Canada's primary SAR aircraft have EO/IR capability so this could be a game changer.

8. Current rotary-wing response times for SAR incidents in the north are measured in days vice hours.[6] Some argue that the C-17 can transport two Griffons into select northern airstrips to execute a SAR mission, expediting the response times. While this argument makes sense on paper, it is quickly discounted when one considers that the Griffon has no de-icing capability so it is severely weather restricted in the north and tasking, loading and transporting Griffons by C-17 would likely take days in reality.

9. Another significant SAR-related capability gap in the north is Canada's ability to respond quickly to a major air disaster (MAJAID). As air traffic increases over the north, so too does the

[5] *Ibid.*

[6] A.M.J. Perry, "Canada's Northern Strategy – A Search and Rescue Challenge or Opportunity" (Solo Flight Paper, Canadian Forces College, 2013-2014), 13.

likelihood of a catastrophic aviation event where survival of victims may be heavily dependent on response time and the ability to move first responders in and remove victims out quickly. Tilt rotor aircraft will move fast and provide that life-saving capability before any other CAF asset.

10. In addition to SAR in the north, the tilt rotor will be an outstanding Whole-of-Government platform, able to reach remote locations for emergency supply, evacuation, scientific and environmental research, or security situations with departments such as Environment Canada, Public Safety, the Royal Canadian Navy (RCN), SOF and the CA.

Army Tactical Aviation

11. The tilt rotor should not be considered as a total replacement for light tactical helicopters such as the Griffon; light helicopters will have their place in tomorrow's fight. The tilt rotor will, however, augment the tactical helicopter squadron by giving them capabilities required in unpredictable environments such as COIN operations. The Commander of the Canadian Army (CA) has specifically asked the RCAF maintain the capability to move a company-sized combat group throughout the battlefield, which is beyond the capability of the light helicopter.[7] Though the CA should be consulted, having sixty to seventy percent of tactical aviation be of the tilt rotor variety will give an appropriate level of flexibility and cost effectiveness for missions. That said, the RCAF should explore a replacement for the Griffon to fill a niche light helicopter role but this is beyond the scope of this paper.

[7] Lieutenant-General P.J. Devlin, *Army Requirement for Tactical Aviation Support,* 13 April 2012.

12. "The likelihood of large force-on-force exchanges will be eclipsed by irregular warfare conducted by highly adaptive, technologically enabled adversaries."[8] It is within this environment where the tilt rotor will thrive. Tilt rotors can move more troops, supplies and equipment faster and farther around the tactical battlefield than any CAF asset. Afghanistan proved the value of tactical aviation, it kept troops and supplies off the dangerous roads and it allowed them to move quickly, leveraging the element of surprise. Tomorrow's CA will be based on Adaptive Dispersed Operations, meaning it will have to move quickly, potentially in smaller section-sized teams to achieve desired effects.[9] With room for 14 troops and plenty of time on station, the tilt rotor will be able to stay with the fight, moving with troops throughout the battlespace rather than just inserting them and returning to base. This ability to stand off close to the battle will enable faster medevac from the battlefield; intelligence, surveillance and reconnaissance (ISR) support throughout the fight; and organic aviation firepower from heavily armed door gunners or a nose-mounted turret gun. There is no other aircraft that can provide this type of capability to the war fighter. Equipped with the right equipment, the tilt rotor also has the time-on-station ability to work as a vital radio communications link, reducing the reliance on vulnerable satellite communications. The most attractive aspect of all this capability to the war fighter is that this support will be organic to their mission. Planning missions with organic transport, ISR, fire support, medevac, communications link and extraction give the war fighter significantly more options while reducing risk considerably. Again, there is no vertical lift transport in the RCAF that can carry out this mission. The tilt rotor will not just enable tomorrow's CA but it will be a force multiplier on the battlefield.

[8] Department of National Defence (DND), D2-188/2007E, *Land Operations 2021: Adaptive Dispersed Operations* (Kingston: Army Publishing Office, 2007), 4.

[9] Department of National Defence, *Land Operations 2021: Adaptive Dispersed Operations* 13.

Attack Aircraft

13. With little political appetite for casualties, the CA must operate with overwhelming force by using ground and air assault assets to ensure our ground troops always have the tactical advantage; future dispersed operations will make this requirement even more critical. Again, experience in Afghanistan demonstrated that Canadians were not the first priority for close air support unless they were involved in a troops-in-contact (TIC).[10] This made executing deliberate operations riskier without organic fire support; missions were often postponed or scrapped due to unavailability of coalition pooled attack helicopters.[11]

14. Recently acquired CH-147 Chinooks are also key battlefield enablers but they are slow, have little defensive or offensive capability and are therefore vulnerable to ground fire as they traverse the battlefield or when they insert and extract troops. While lightly armed Griffons provided some fire support to Chinooks while operating in Afghanistan, their slow speed meant the Chinooks also had to reduce speed substantially, making them more vulnerable.[12] Adding to their slow speed, the Griffon had little effective range, which meant the Chinooks often had to return to base so the Griffons could refuel, further decreasing the effectiveness of an outstanding and expensive RCAF asset.

15. The attack variant tilt rotor will provide heavy fire support and the speed necessary to move fast with utility tilt rotor troop transports or the Chinooks creating an effective air mobile tactical capability that the CA is looking for.[13] Adaptive dispersed operations when combined with a low tolerance for casualties within the full spectrum of conflict will demand immediate

[10] Lieutenant-Colonel Dave Forbes, SOF Tactical Helicopter pilot in Afghanistan, telephone conversation, 2 February 2016.
[11] *Ibid.*
[12] *Ibid*.
[13] Lieutenant-General P.J. Devlin, *Army Requirement for Tactical Aviation Support*, 13 April 2012.

close air support that can only be provided by deliberately placed and nationally owned aviation fire support.

16. The attack variant tilt rotor will be kept in one squadron located at the Wainwright Combat and Maneuver Training Center where the CA can capitalize on their use during high-readiness training work-ups and where aircrew skills can be maintained at a high standard. Additionally, aircrews have easy access to the large Cold Lake Air Weapons Range for training.

Special Operations

17. Canadian SOF currently relies on the Griffon for most of their lift with future augmentation coming from the newly purchased Chinooks. While this solution may often be adequate in the SOF domestic role, it was proven inadequate when our SOF was engaged in the Afghanistan conflict where SOF was forced to contract MI-17 medium lift helicopters for exclusive SOF use. SOF operators did not train with these aircraft and the aircrews had to take short courses on type before they could be useful; both operators and aircrew took time to be proficient in their use.[14] The MI-17 added great capability to SOF but that capability is gone again and difficult to regenerate.

18. Robert Spulak defines one of the distinguishing characteristics of SOF as "the ability to rapidly and securely transport, insert and extract SOF".[15] The tilt rotor will give SOF the platform necessary to achieve two currently missing critical elements of relative superiority: repetition and speed.[16] With tilt rotors organic to 427 SOAS, SOF will be able to practice with

[14] Lieutenant-Colonel Dave Forbes, 2 February 2016.
[15] Robert Spulak. "A Theory of Special Operations." *Military Technology* 33, no. Special Issue (2009): 26.
[16] William McRaven, "The Theory of Special Operations" (master's thesis, Naval Post Graduate School, 1993), 12, 23, and 30.

the same platform with which they fight and they will have organic speed and range that is an ongoing concern with regards to RCAF fixed-wing asset availability.[17]

Concept of Command and Control

19. Since various roles can be performed with the same basic platform, it will make sense to set up a system in accordance with the RCAF's mantra, centralized control and decentralized execution. In this particular case it will mean centralized life-cycle and in-service support concepts with decentralized employment, similar to the way 1 Wing operates the Griffon. The life-cycling, airworthiness, third line maintenance management and operational control will fall under the purview of 1 Wing, 1 Canadian Air Division and Assistant Deputy Minister (Materiel) (ADM(Mat)); aircraft tactical control and first/second line maintenance will be decentralized in a remote squadron set up, much like 427 Special Operations Aviation Squadron (427 SOAS) and 450 Tactical Helicopter Squadron (450 THS).

20. Due to the potentially complex resource allocation challenges, 1 Wing will control aircraft distribution to all units except the SOF aircraft, which will be permanently allocated to 427 SOAS and rotated out as required for life-cycle management. This central control will ensure airframes are appropriately apportioned and maintenance cycles can be managed. This will also allow SOF to maintain their required responsiveness without unnecessary operational security exposure.

21. Northern SAR will be based out of Yellowknife, SOF will be based out of Trenton or Petawawa, depending on the future home of Joint Task Force 2. The existing tactical helicopter

[17] Major Jay Thompson, JTF2 Squadron Commander, Syndicate 9 discussion, 29 January 2016.

squadrons will be augmented by the new tilt rotor utility aircraft as deemed appropriate by the Army but the attack version will be kept in Wainwright for economy of training, ammunition handling, and other variant-specific support tail enablers.

CONCLUSION

22. The CAF has significant capability gaps that can be filled by one multi-purpose platform. Tilt rotors of tomorrow will have the speed, agility, range and payload needed for future combat and SAR missions. Future tilt rotor aircraft will have the right mix of capability and cost effectiveness that make it an attractive contender for a future partial Griffon replacement. Not only will it offer the CA and SOF improved capability but it will offer the Government an effective tool for use in Canada's north for Whole-of-Government operations and SAR.

RECOMMENDATION

23. The RCAF should closely monitor and consider tilt rotor technology to partially replace the Griffon fleet as well as adding additional units to fill capability gaps in northern SAR, attack aircraft and SOF roles.

BIBLIOGRAPHY

Bell Helicopter V-280 Valor, Last modified [or accessed] 7 February 2016, http://www.bellhelicopter.com/military/bell-v-280

Bolkom, Christopher. *CRS Report for Congress: V-22 Osprey Tilt Rotor Aircraft*. Washington: Congressional Research Service-The Library of Congress, updated January 7, 2005.

Canada. Department of National Defence. B-GA-404-000/FP-001, *Canadian Forces Aerospace Move Doctrine.* Winnipeg: Canadian Forces Aerospace Warfare Centre, 2011.

Devlin, Lieutenant-General P.J. *Army Requirement for Tactical Aviation Support.* Commander Canadian Army, National Defence Headquarters: file 3183-1 (DLFD 3) 13 April 2012.

McRaven, William. "The Theory of Special Operations," Master's thesis, Naval Post Graduate School, 1993.

Perry, A.M.J. "Canada's Northern Strategy – A Search and Rescue Challenge or Opportunity," Solo Flight Paper, Canadian Forces College, 2013-2014.

Poitras, D. "Search and Rescue in the Arctic: A Myth or Reality?" Master's thesis, Canadian Forces College, 2012-2013.

Spulak, Jr., Robert G. "A Theory of Special Operations." *Military Technology* 33, no. Special Issue (2009): 23-28