





RCAF VIRTUAL BATTLESPACE: THE FUTURE COULD BE NOW

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RCAF VIRTUAL BATTLESPACE: THE FUTURE COULD BE NOW AIM

1. To discuss the necessity of advancing networked live, virtual, constructive (LVC) distributed mission training (DMT)¹ simulation as the future for the Royal Canadian Air Force (RCAF) and as the solution to its collective, joint and coalition training requirements. Simulation is already a strong pillar of RCAF training yet remains largely platform centric for individual skill sets, with limited opportunities to train beyond the squadron level. Further investment is needed to be able to employ this technology to its full potential, to create a virtual battle space² in which RCAF units can prepare with each other, with the other elements and with our allies.

INTRODUCTION

2. The Force Generation (FG) problem space is a network of factors ranging from the physical to the financial. The RCAF is currently a mix of fragile, aging platforms and newly-acquired platforms, and these require integration. This integration is happening in an environment of Yearly Flying Rate (YFR) pressured by both cost and operations, and handled by under staffed units struggling to balance operational demands with force generation. The use of platform simulators to train individual skill sets is already well entrenched in the RCAF, even if the accepted balance of live flying versus simulation

Live simulation: simulation involving real people using real systems Virtual simulation: simulation involving real people using simulated systems Constructive simulation: simulation involving simulated people using simulated systems Distributed simulation: networking of geographically dispersed simulators of model components that exercise as a single overall model.

CAE Inc. RCAF Virtual Battlespace Draft Concept of Operations (CONOPS). Ottawa: 2015. 1.

¹Accepted definitions are:

² "Virtual Battlespace" : an integrated tactical, operational, and strategic level training system to support graduate aircrew in achieving and maintaining operational readiness"

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varies per community. It is in the realm of collective, joint and coalition training that live fly has significant deficiencies and investment into networked simulation is critical.

3. The United States Air Force (USAF) has led the way in the use of LVC for collective, joint and coalition training via its exercise series Coalition Virtual Flag (CVF), in which Canada has participated to an increasing degree over the last several years. In 2013, influenced by the USAF and by growth in this technology, former Comd RCAF LGen Yvan Blondin established a working group under the newly established Directorate of Air Simulation and Training (Dir Air Sim & Trg). This working group produced Simulation Strategy 2025^3 , a policy and comprehensive plan to advance all RCAF simulation including collective LVC DMT. Although distributed in CANAIRGEN 03/15, this document was neither endorsed nor adopted. Despite this command-level reticence, the Royal Canadian Aerospace Warfare Centre (RAWC) has continued to promote the use of LVC DMT under its Force Development mandate. This paper will discuss the advantages of simulation over live fly for advanced levels of training, outline the USAF strategy and structure and use the recent successes of the Air Defence community using CVF to make recommendations for a revival of Canadian simulation policy and further investment in LVC DMT architecture.

DISCUSSION

4. The RCAF is not new to the concept of participating in distributed collective simulation training exercises. As the technology matures and our allies advance their use of it, more RCAF personnel familiar with its benefits are pushing for the inclusion of

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³ Royal Canadian Air Force. Simulation Strategy 2025. (Ottawa, 2014). ix.

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such training in Canada. Simulation is the next domain of training and collective training in a virtual battle space, it is the logical evolution. Some work has been done in this arena, but in order for the RCAF to fully benefit from simulation training, there is a great deal more work and investment to be done.

5. <u>Live Fly Limitations</u>. Currently there is not a prescribed live collective training program for the RCAF⁴. Fleets must balance their training requirements against platform availability, and choose to take part in combinations of exercises led by the other elements and in variable international opportunities. For FY 19/20 an estimated \$5 million⁵ will be spent on RCAF participation in live exercises at the collective, joint and coalition levels. Any number of operational and physical (weather) factors can affect this form of training, and although simulation is not to be considered a replacement for live fly training, it offers a stability and consistency that live flying lacks.

6. The case for simulation over live in individual training has long been understood: reduced YFR necessary for training; less wear and tear on air frames; a lower environmental impact by less fuel usage; and, the most dominant in terms of training; a more controlled, consistent training environment. The benefits of collective training via simulation are equally compelling. Collective training in a virtual battle space would allow for complex, collective and joint training in scenarios not achievable in live due to asset availability, cost, or risk. Most importantly in the domain of risk, simulation allows for lessons learned and doctrine development by allowing for failure without catastrophic consequence.

⁴ Email from LCol Carl Gravel, 1 Canadian Air Division A5. Dated 18 Oct 2019.

⁵ Ibid. included chart data on collective RCAF exercises. 3/12

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7. <u>Simulation advantages</u>. In distributed collective simulation it is the *mission sets* that would be trained, not just the individual skills. An example from *Simulation Strategy 2025* is that of ISR practiced in the Arctic: in a virtual joint battle space, the Long Range Patrol Community could train with assets from the Royal Canadian Navy, supported by Unmanned Aerial Vehicles (UAVs), Canadian Army Rover assets on the ground, and linking all data into the Canadian Air Defence Sector to be shared with Combined Air Operations Centre (CAOC) in Winnipeg.⁶ To stage this scenario for "real" would be prohibitively expensive, be affected by the availability of air frames and deployable personnel, and certainly be impacted by the hostile Arctic environment. Repeating this exercise live often enough to train all crews in a constant training cycle, and to develop and test doctrine, is essentially impossible.

8. The next level of this example is the very real potential of training operationally with Allied nations. Linking the above into the United States' LVC DMT infrastructure would link United States Navy ships, Airborne Warning and Control Systems (AWACS), and assets such as space and cyber into a collective, joint, and international training scenario to rehearse Canadian sovereignty protection in the Arctic. Rehearsal would drive the creation of doctrine and TTPs development in a controllable, repeatable, measurable domain.

9. <u>USAF LVC Plan.</u> The USAF is leading the world in developed policy and investment in terms of the use of simulation and networked LVC. In its policy document *Air Force Operational Training Infrastructure: 2035 Flight Plan*, the USAF sets a clear

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⁶ Royal Canadian Air Force. Simulation Strategy 2025. (Ottawa, 2014), 5.

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objective to "provide a relevant and realistic training environment that will allow units and crews to conduct tactically relevant training"⁷ in what is labelled "integrated multidomain operations command and control training systems"⁸. This supports its vision statement of "…a relevant training environment which allows weapons systems and operators to interact in a highly dynamic, realistic manner including multi-domain and control aspects. This fight will, with very few exceptions, include coalition partners."⁹ The USAF demonstrate a clear focus beyond individual simulators and into the networked distributed domain for collective training, maximizing the technology's utility.

10. <u>Distributed Mission Operations Centre (DMOC)</u>. In order to run collective LVC training, it is necessary to establish a common control architecture allowing for the use of common scenarios, effective monitoring and execution control¹⁰, in short, the centre node of a system of systems. One of the strengths of the USAF model is the existence of a DMOC, the 705th Combat Training Squadron (CTS), located at Kirtland AFB. The CTS provides the structure of a coordination centre, integrating requirements from the tactical and operational fleets, managing the simulation connectivity of the participating fleets, developing a common scenario, and generating the enemy force as constructive entities in the simulation.

11. <u>Coalition Virtual Flag/Spartan Alliance Exercises</u>. No better proof of the utility of the concept of collective LVC DMT exists than CVF, run by the 705th CTS. With three annual serials dedicated to USAF- only collective training, the fourth serial of CVF is a

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⁷ United States Air Force. *Air Force Operational Training Infrastructure: 2035 Flight Plan.* 2017. 9.

⁸ Ibid, 8.

⁹ Ibid. 5.

¹⁰ Royal Canadian Air Force. Simulation Strategy 2025. (Ottawa, 2014). 22.

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US- led coalition exercise with Canada, Australia, British and other Allied Forces. Well beyond stove piped platform simulation training, CVF is sponsored by Air Combat Command and mandated to provide training in,

a synthetic theater-level, major combat operations, contest, degraded, and operationally limited environment. It provides relevant and realistic joint operation scenarios based on current theatre plans. CVF is scalable and tailorable to unit requirements by integrating air, land, cyber, space and maritime weapons systems utilizing virtual and constructive simulations.¹¹

12. Canada has been participating in CVF since 2009 in increasing capacity as simulators become networked. An assessment by RAWC for CVF 18-4 was that it delivered training in joint operations that the CAF may need to be able to execute in the future and for which it is not currently training.¹² A future potential area of growth for Canada could be participation in Exercise Spartan Alliance. Starting in 2015, it is a US-led virtual and constructive exercise involving networked C2, air and ground simulators.¹³ Run from a DMOC known as the Warrior Preparation Centre in Eisiendherhof, Germany, the most recent version of the exercise involved the Italian Air Force and NATO forces for the first time, demonstrating growth in the international appetite for this training medium.

13. Following the US example should be done in two parts: in continuing to develop our infrastructure in order to participate in their exercises for the coalition/ allies level of

¹¹RAWC. Post Exercise Report – Exercise Coalition Virtual Flag 18-4. (2018), 2.

¹² Ibid, 6.

¹³ Tech. Sgt. Rachel Waller. US, *Italian air forces, NATO work together for exercise Spartan Alliance*. (2018).

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training, and in order to set up our own DMOC and exercise structure for smaller, joint and collective training.

14. <u>Current RCAF network</u>. Canadian Forces eXperimental Network (CFXNet) is the network managed by the Canadian Forces Warfare Centre which is available and capable of supporting up to 2 EYES classified distributed mission simulation.¹⁴ Multiple simulators within the Royal Canadian Navy, Canadian Army, and RCAF have been connected to CFXNet, which allows for the potential for collective and joint training to take place. Connectivity to exercises such as CVF is achieved by RCAF simulation assets via the central node at Shirley's Bay, through a gateway manager into US networks such as JTEN. The structure and connectivity pieces are in place to allow for a more robust future in simulated collective training should the RCAF make it more of a training priority for the fleets, but would likely require additional bandwidth.

15. <u>Distributed Simulation Collective Training Successes</u>. In June of 2018, 22 Wing North Bay, with support from 1 Canadian Air Division (1CAD) and the RAWC, brought online the Mission Training Centre (MTC). This simulation centre was designed for multiple training requirements within the Air Defence community, ranging from *ab initio* up to full mission crew simulation, from tactical data link to full command and control. One of the most important functions of the MTC is its connectivity into CFXNet and thereby into CVF, "a huge step in making the RCAF an LVC-capable air force" according the LCol Bouchard, from the RAWC Modelling and Coordination office. ¹⁵

 ¹⁴ CAE Inc. Simulation Ties Task 652 Distributed Mission Operations Planning Process. Ottawa: 2017. 17.
 ¹⁵ Canada. RCAF Public Affairs. "22 Wing North Bay Mission Training Centre Officially opens" 20 Jun 2019, last accessed 13 Oct 2019.

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16. <u>Air Defence Community successes</u>. The MTC was used by a full NORAD mission crew to participate as a Command and Control (C2) element in CVF 19-4. The Mission Crew Commander from the exercise described the training as an incredible exchange of Allied/Coalition TTPs and a chance to exercise mission sets with the USAF, RAF and RAAF to a level of complexity that would be impossible to replicate in the "real world".¹⁶ For the Air Defence community, the MTC employs replicates nearly exactly the C2 weapons system, allowing an immersive experience in the simulation. Future participation and value for each fleet would be dependent on the investment in their respective simulator(s), as well as the investment into CFX-Net connectivity.

17. <u>Canadian Strategy</u>. *Simulation Strategy 2025* was published in 2015 with the intent to save 2 billion dollars over 20 years with the adoption of a "more coherent policy in the employment of virtual training as well as reduction in live flying training"¹⁷. It was estimated that the implementation of the plan would cost \$544 million¹⁸, and would shift the balance of simulation and live flying in readiness training, including a greater emphasis on networking LVC trainers by maximizing common software and connectivity. The proposed employment at the time ranged from the collective and joint level, such as networking the CP 140, CH 148 and RCN simulators for maritime training, to the CF188 Advanced Distributed Combat Training System (ADCTS) with the CAOC to facilitate NORAD training. Supported by a 2015 draft study, *RCAF Virtual Battlespace CONOPS* written by CAE Canada Inc., for D Air Sim & Trg, it called for the establishment of the 'virtual battlespace' for Canada, with a fully networked and manned

¹⁶ Email from Maj Andrew Lunn, CO 51 AC&W OT Sqn, dated 1 Oct 2019.

¹⁷ Trevor Nash. "Virtual Cost Savings: RCAF introduces its new simulation strategy" Jane's. 25 Mar 2015,. Last accessed 10 Oct 2019.

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DMOC managed by the RAWC, governed by D Air Sim & Trg, following fleet readiness plans and an operational readiness plan created by 1 Canadian Air Division (1 CAD) A7. It was, and is, an ambitious plan that was regrettably never fully endorsed or actioned, likely due to the high cost in both fiscal and human resources that it would take to fully implement.

18. Although the grand vision for 2025 has not been set in motion, work in the LVC DMT domain has kept progressing (as with the discussed MTC and other simulators), albeit in a slower, more ad hoc manner. The reorganization of the RAWC includes plans for a 128 Exercise and Simulation Squadron, envisioned to be response for Tier 1 RCAF Exercises such as CVF, but currently there are no plans to create the exercise design component.¹⁹ The platform simulators are the equipment; increased connectivity would let us train as a team, but a properly established Canadian DMOC would allow us to organize an actual game plan. The RCAF needs to advance all three components in order to break free from 'stove pipe' training, and keep pace with our allies in order to be able to train with them in this medium of the future.

CONCLUSION

19. To summarize, LVC DMT is the future of training at all levels, for all elements in the CAF, but especially the RCAF. If done correctly, it could provide what live fly training struggles to deliver: controlled, replicable training in simulated "real" theatres at the coalition level. The benefit of reduced wear and tear on airframes combined with the Yearly Flying Rate (YFR) savings cannot be ignored. The potential for the development

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¹⁹ Email from LCol Marc Bouchard, OC MSCO, RAWC, dated 11 Oct 2019.

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and testing of doctrine, TTPs as well as providing a consistent flow of operational training to the RCAF is only limited by the imagination.

20. If the RCAF followed the example set by the USAF, the issues of stove piped training, lack of collective training and lack of opportunities for joint or coalition theatre training could be solved. Recent successes in exploiting this medium by the Air Defence community should be examined and the capability pursued for the other fleets. Although the size and scope of the *Simulation Strategy 2025* could have been the reason for its lack of full implementation, portions of it such as increasing technical infrastructure and the creation of a Canadian DMOC are critical for the RCAF future. It is time to the RCAF to get invested in LVC DMT for collective training, or get left behind while other nations train without us.

RECOMMENDATIONS

21. It is therefore recommended that the RCAF:

a. create a simulation governance body for the RCAF, comprised of all invested players; 1 CAD A5/7, 2 CAD, Dir AF Trg, RAWC, and Dir Air Sim & Trg;

b. task the above governance body to create an actionable RCAF Policy on Simulation, to be signed by Comd RCAF; and

c. insist on participation of more platforms in exercises such as CVF in order to build up corporate knowledge for future growth.

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