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Operational Test and Evaluation Planning for Large-Scale Capability Influx

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AIM

1. Technology is constantly evolving. Computers and tech are no longer the domain of the few but are utilized in all Canadian Armed Forces (CAF) branches. For the Royal Canadian Air Force (RCAF) to remain relevant, as the newly released *RCAF Strategy* describes it "must modernize and evolve in response to this rapidly changing security environment."[1] This service paper will inform the RCAF Comd about the upcoming capability acquisition enterprise and its associated Operational Test and Evaluation (OT&E) requirements. OT&E is not a new concept but is often still an afterthought. Nevertheless, it remains an essential part of the Department of National Defense (DND) acquisition process.

INTRODUCTION

2. "OT&E is conducted to assess the operational capability of an item, through testing in as realistic an operational environment as possible."[2] It looks to determine, through the testing process, the item/procedure/equipment suitability for specifically identified roles. OT&E allows the RCAF to identify and address any issues with equipment or procedures before they are deployed, reducing risks to personnel and saving resources. Engineering Test & Evaluation (ET&E), which will not be further discussed, is the testing process concerned with "technical performance specifications and regulatory safety standards."[3] Though sometimes placed under the same umbrella, both types of testing provide the user with different data. The testing process can take a few months for simple requirements to multiyear testing programs on more extensive capability programs such as new aircraft acquisition, like the C295. The testing system itself is also a multi-step process which covers: the initial request, development of the project estimate, development of the test plan, execution of the testing and the final report.

3. In February 2023, the release of the new *RCAF Strategy,* where emphasis on the capabilities required by the air force to remain relevant on the world stage was made clear.

> Continued technological development will be crucial to protecting Canadian sovereignty, fielding credible expeditionary capabilities and enabling the RCAF to integrate within the CAF joint force and with our closest allies. Emerging and disruptive technologies create an environment that will require defence innovation at the speed of relevance.[4]

[1] Department of National Defence, *RCAF Strategy*, p.1
[2] Department of National Defense, Canadian Flight Test Orders, p. 1-1-3
[3] Department of National Defense, Canadian Flight Test Orders, p. 1-1-2
[4] Department of National Defence, *RCAF Strategy*, p.5

Ten new capabilities will arrive and aim to be operational within the next 12 years.[5] The direction further emphasizes the importance of Artificial Intelligence (AI), Machine Learning (ML) and Sensor Fusion. This also aligns with the increase of capability/capacity outlined in *Strong, Secure, Engaged*. This emphasis does not negate the need for OT&E but further emphasizes the need to execute testing in critical time and space.

4. Despite the known importance of OT&E, there remain issues with the process that will continue to slow down the speed at which the RCAF can turn over new technological capabilities: acquisition of OT&E timing in the integration of the acquisition process, OT&E heavy requirement air systems, and current staffing requirements. This paper will cover these inefficiencies that may become unsurmountable if not addressed before significant capability acquisitions in numbers and scope and three solutions to alleviate some of this friction.

DISCUSSION

Procurement Difficulties

5. OT&E is a function of military procurement, a lengthy and intensive process that DND breaks down into phases[6]. It can be understood as: "a need is identified, purchase approval is obtained, a contract is awarded, initial delivery occurs, full operating capacity is achieved, and project is closed."[7] In most instances, testing will occur once the CAF has received the subject. Problems arise if issues are found throughout testing that the RCAF could have potentially caught previously had the OT&E entity been included in the process earlier. By the time the testing begins, catastrophic problems could be identified that may leave the platform unable to complete the mission for which it was purchased. The latest example of this happening is the purchase of the C295 Kingfisher aircraft, which is meant to replace the CC130H model for Search and Rescue (SAR).

6. Purchased under the assumption that it could be modified to meet the required mission safety standards; once the C295 arrived, substantial safety issues were quickly discovered, and massive delays to the program occurred, putting the project back an estimated 3-5 years. This situation has caused significant problems as the C115 had a hard retirement date, which left the west coast without a fixed-wing SAR asset. The RCAF has mitigated this with C130H deployments to Comox, BC, but this has caused further deficiencies in the central Trenton SRR and large personnel movements. RCAF creativity, thru OP SALUS, has mitigated some of these issues by shifting C130J aircraft

[5] Department of National Defence, *RCAF Strategy*, p.17
[6] National Defence, 'Defence Purchases and Upgrades Process', education and awareness, 11 March 2013, https://www.canada.ca/en/department-national-defence/services/procurement/defence-purchases-and-upgrades-process.html.
[7] Maj A. Soundy, 'Modeling and simulation based operational test and evaluation: is this the panacea for CF acquisition?'(Ex. New Horizons, CFC, 2006) p.4

into 424 Squadron as the fixed-wing asset. Unfortunately, this has also increased OT&E requirements, as the C130J does not currently fly SAR missions in Canada.

7. The new *RCAF Strategy* directs the institution to stop accepting this as the status quo and work with DND/CAF and Defence Procurement Strategy (DPS) to streamline the processes.[8] However, like everything else in the military, change happens slowly. It doesn't negate the ongoing issues with OT&E. It's essential to note that OT&E is not only conducted on large airframe purchases but also equipment, software upgrades, and all air systems. Yearly, the RCAF looks at all projects requiring testing and ranks them on the Air T&E Master Plan (ATEMP). In 2022-23, the number of projects requiring testing was 404, with an additional 117 projects added in May 2023. Most of these projects are not tested due to personnel power available at the sqn level. As the RCAF is currently looking to increase the number of projects requiring testing with the acquisition of 10+ systems, there will be an increase in accepted risk for projects that will likely not ever get into testing windows. Prioritization will be required as the ability to conduct testing remains decreased due to reconstitution efforts.

Current OT&E Establishment

8. In the current process, 434 (OT&E) Sqn is "to provide responsive full-spectrum OT&E support to the RCAF including ADM (Mat), DGAEPM, 1 Cdn Air Div, and 2 Cdn Air Div"[9]. The squadron is broken down into Flights that specialize in various airframes. Some Test Evaluations Flights (TEFs) are only assigned one airframe, such as Maritime Helicopter Test & Evaluation flight (MHTEF), whose 8+ person team deals with all requirements for the CH148 Cyclone and are therefore experts on the aircraft and systems. Others, such as the Transport Operational Test & Eval Flight (TOTEF), have a small five-person team that must cover 6-7 airframes, which can cause delays in testing. The load when the new fleets come in will not be levelled across the board. Due to the flights being geographically located across the country, moving between TEFs and associated support becomes harder. As with the entire RCAF, 434 (OT&E) Sqn is understaffed and facing an ever-increasing OT&E demand that is not likely to change anytime soon. The requirement to test new equipment and air systems continues to grow, as indicated by RCAF Comd and 434 (OT&E) Sqn will need to be sufficiently staffed to keep things moving at the "speed of relevance."[10]

9. The current staffing remains unchanged since 434 (OT&E) Sqn was stood up at 48 pers. As of Feb 2023, the sqn is staffed to 100%. However, this number does not reflect the required personnel to manage the current projects. More calculations analyzed

[8] Department of National Defence, *RCAF Strategy*.
[9] Department of National Defence, 434 Sqn Project Officer`s Guide p.2-1
[10] Department of National Defence, *RCAF Strategy*.

by the sqn indicate that an establishment of up to 125 individuals is required. This number will need to be revisited with the current influx of projects.

Criticality of OT&E

10. The importance of OT&E is often dismissed at all levels as an inconvenient time drain. The matter must be clarified, and this mindset must change. The worst-case scenario for poor or incomplete OT&E in the RCAF is death. For example, the CH148 Stalker 22 crash in 2020[11] can be partly tied to incomplete OT&E as it did not consider computer bias in all manners that the crew would fly the aircraft. Similarly, the C130J parachuting mishap in 2019 triggered two test projects on hung jumper retrieval procedures and publications.[12] The RCAF needs to find ways to improve the relevant speed of testing to support the required modernization of all fleets without taking away crucial testing processes.

Early implementation of OT&E

11. One of the three options suggested in this paper to assist in reducing friction, and increasing acquisition success is the early implementation of OT&E. As noted above, testing often falls in the later phase once new capabilities have arrived. Most fleets are eager to use the latest equipment by this point but must wait until the testing process is complete. If OT&E is included earlier in the process, including in the Operational Implementation Working Group (OIWG) as a partner, there is more likely to have success on a shorter timeline. In addition, the OT&E representative in the process needs to be a more active member of the discussions. Often, though invited, working groups tend to gloss over the testing requirements as something that is done later.

12. The technical and practiced experience of the OT&E community will allow earlier visibility on issues, including solutions for moving forward. This process would allow minor problems to be dealt with before becoming intractable, costing the CAF millions. In addition, clear direction on OT&E involvement in the process by the Chain of Command (COC) will assist in shaping successful new capabilities.

Reduction of OT&E requirements.

13. It is impossible to eliminate the need for testing in implementing new capabilities. However, when facing large amounts of new capability requirements, the system may be able to reduce the amount of OT&E required. Purchasing systems already in use is a

[11] National Defence, "Flight Safety Investigation Report for Stalker 22 Accident," Canada.ca (Government of Canada, June 28, 2021), https://www.canada.ca/en/department-national-defence/news/2021/06/flight-safety-investigation-report-for-stalker-22-accident.html.
[12] National Defence, "Government of Canada," Flight Safety - Royal Canadian Air Force - Canada.ca (/ Gouvernement du Canada, April 22, 2021), https://www.canada.ca/en/air-force/corporate/reports-publications/flight-safety-investigation-reports/cc130j608-paratrooper-accident-epilogue.html.

straightforward way of reducing test requirements. The best example is the C17, purchased from the US and already employed as a Strategic airlift by the US and other countries. Procuring and operating the aircraft as intended meant that very limited OT&E was required because the procedures, equipment, and technology were already tested. In fact, to this day, the C17 has one of the smallest continuous OT&E involvement from 434 (OT&E) Sqn. Compared to the C295, which is experiencing years of delays, the C17 could be placed into operation quickly.

14. *Strong, Secure, Engaged* emphasizes the importance of joint and combined operations.[13] Buying something similar to US/NATO air systems allows for better interoperability. Purchasing similar equipment provides for a reduction in problems arising when they are interfacing. Aircraft maintenance, support, and operations with and at other nations' locations are easily achieved through similarly tested capabilities.

Tiger Team Approach

15. RCAF requirements do not always lend to purchasing off-the-shelf products. If the first option is unavailable, or when a system must have Canadian specifications/modifications, the Tiger Team approach is the best option. This approach would allow the current TEFs at 434 (OT&E) Sqn to continue working on active projects and not take on OT&E bandwidth for a specific project when a newer approach is available.

16. This Tiger Team approach is currently used by Special Operations Aviation Test and Evaluation Flight (SOATEF) and has proven successful. Their system consists of gathering experts from the various communities into a team to work on a specific project, led by a qualified Project Officer, while the requirement is there to conduct testing and then return to the community on completion. This allows multiple benefits. Firstly, it will enable the TEF to surge when larger capability projects are required, pulling in experience from within the community using the system in question and knowing the expected mission set. Secondly, it allows community members to gain experience in OT&E, possibly gaining qualifications to take back to their fleets. This can also be leveraged to RCAF advantage as those individuals now understand the importance of testing programs and could be posted into 434 (OT&E) Sqn later. Both benefits allow the OT&E enterprise to grow its base in the general population, which is excellent for the RCAF.

17. A difficulty that may be encountered with Tiger Teams is that other units, just as 434 (OT&E) Sqn, do not have the full staffing capability. Balancing priorities and clear direction from the chain of command will also benefit the institution.

[13] Department of National Defence, *Strong, Secure, Engaged*.

18. A few solutions were not developed in this paper but are worthy of further study. Increasing the establishment of 434 (OT&E) Sqn to the full 125 positions will ease the burden on current personnel and increase desired output. Maj A. Soundy presented a paper in 2006 on the value/importance of Modeling and Simulation early in OT&E.[14] Further encouraged research into the digitalization of the OT&E processes, which will decrease the time required to develop reports, is suggested.

CONCLUSION

19. The *RCAF strategy* provides a framework for the future regarding the mission and incoming capabilities. The RCAF needs to be flexible, agile, and innovative to meet these mandates.[15] None of these above recommendations needs to be selected individually. To achieve the most success for the institution, all three options should be implemented to assist the DND acquisition process and overall OT&E enterprise. Manning issues, delays in testing member involvement, and OT&E-heavy capabilities hinder and delay the arrival of time-sensitive and relevant capabilities into the hands of operators. The RCAF needs to stay current in today's complex technological world and cannot do this if its capabilities are delivered past the time when they are cutting edge.

RECOMMENDATION

20. It is recommended that the Commander RCAF:

a. **Direct** 434 (OT&E) Sqn must set up specific capability OT&E tiger teams to concentrate their forces on extensive capabilities;

b. **Provide** guidance to RCAF Procurement entities on the benefits of procuring off-the-shelf capabilities that do not require testing and can be put straight into service with little or no OT&E; and

c. **Direct** 1 CAD OA and CO 434 (OT&E) Sqn to develop streamlined processes to reduce the time lost in the OT&E documentation process.

[14] Maj A. Soundy, 'Modeling and simulation based operational test and evaluation: is this the panacea for CF acquisition?'(Ex. New Horizons, CFC, 2006)
[15] Department of National Defence, *RCAF Strategy*.

BIBLIOGRAPHY

Defence, National. “Flight Safety Investigation Report for Stalker 22 Accident.” Canada.ca. Government of Canada, June 28, 2021. https://www.canada.ca/en/department-national-defence/news/2021/06/flight-safety-investigation-report-for-stalker-22-accident.html.

Defence, National. “Government of Canada.” Flight Safety - Royal Canadian Air Force - Canada.ca. / Gouvernement du Canada, April 22, 2021. https://www.canada.ca/en/air-force/corporate/reports-publications/flight-safety-investigation-reports/cc130j608-paratrooper-accident-epilogue.html.

Defence, National‘A-GA-005-000/AG-002, Air Test and Evaluation Manual’, 2018

Defence, National‘434 Operational Test & Evaluation (OT&E) Squadron Project Officer Guide, V2.01, 2020

Defence, National ‘Canadian Armed Forces Flight Test Orders (C-05-020-007_AM-000), 2020

Defence, National, Operational Airworthiness Manuel V4.0 - 21 June 2022

Defence, National. ‘Defence Purchases and Upgrades Process’. Education and awareness, 11 March 2013. https://www.canada.ca/en/department-national-defence/services/procurement/defence-purchases-and-upgrades-process.html.

Defence, National. ‘Strong, Secure, Engaged’. 2017

Defence, National. ‘RCAF Strategy’. 2017

Emond, Maj A, ‘Test and Evaluation: Designing Air Power for Postmodern Warfare.``Solo Flight, CFC, 2019

Soundy, Maj A, ‘Modeling and simulation based operational test and evaluation: is this the panacea for CF acquisition?’ Ex. New Horizons, CFC, 2006