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Employment of Naval Technical Officers

Lieutenant-Commander Brian Harper

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Exercise Solo Flight

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Employment of Naval Technical Officers

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INTRODUCTION

1. This persuasive essay will argue that, beyond the rank of Lieutenant(N) (Lt(N)), Naval Technical Officers (NTOs) are employed in a sub-optimal way across the Materiel Acquisition and Sustainment (MA&S) enterprise, such that the essential contributions of the occupation to the current and future state Royal Canadian Navy (RCN), are diminished.

2. This thesis will be advanced by examining how these officers are employed relative to broad themes foundational to military service and conclude by suggesting how changes to this employment model could maximise the performance of this occupation within the current structure of the Department of National Defence (DND) and the Canadian Armed Forces (CAF). Importantly, this paper will not explore any radical shift in the occupational structure or competencies expected of this cadre of officers, but rather look to identify key structural considerations which, if considered by senior decision makers, may have disproportionate effects mitigating the perpetual shortage of senior officers by removing overlap between uniformed and civilian engineers within the Naval Technical Community and increasing alignment between the RCN operational community and Departmental acquisition processes. These premises will fall into one of three broad themes, which have been identified by the author as foundational to military service in this occupation. They will be supported by an array of contemporary academic and institutional literature.

BACKGROUND

3. NTO is one of two officer occupations that comprise the Naval Operations Branch of the RCN. Together with Naval Warfare Officers (NWO), this cadre of CAF officers

are uniquely dedicated to the leadership of non-commissioned members (NCM) within the hard-sea trades (those occupations which by their nature are linked to the operations of ships and submarines) as well as the operational and technical readiness of RCN units.¹ Indeed, the fact that the Naval Operations Branch includes exactly two officer occupations, one who generates the Commanding Officers of every ship and the Commander of the RCN, while the other generates mainly staff officers in sustainment and project management functions, suggests an institutional dynamic with many interesting juxtapositions which may inform structural decisions related to ongoing culture change and CAF reconstitution in the wake of the twin crisis of sexual misconduct revelations and Covid-19 pandemic. At the very least, the CAF should employ military leaders to the greatest possible effect in the service of Canada and adjust as context and external forces dictate.

4. The careers of junior NWOs and NTOs progress more-or-less in lock-step for the first half of their careers, up to and including the rank of Lt(N).² That is to say, these junior officers undergo training and at-sea operational experience of increasing complexity, aimed at developing the competencies required for the safe and effective operation of CAF maritime forces and the leadership of the NCMs and subordinate officers in their charge. The culminating point of this parallel career path happens as senior Lt(N)s where both trades are employed as head of department (HOD) in a major warship or submarine. This tour as HOD is the final point at which NTOs are employed

¹ Not to ignore the essential contributions of officers from the Logistics, Maritime Aviation, Intelligence Branches etc, but as these cadres of officers are either generated by other services, or considered *purple*, in that their employment is universal and are managed separately i.e. not tied strictly to the maritime domain, and so are not included in this paper

² For the purposes of this paper, a member's career will be referred to as having two halves. The first, up to and including the rank of Lt(N) and the second, from LCdr to retirement.

in operational vessels, while NWOs potentially continue their sea-going career as Executive Officers, Commanding Officers, and subsequently to higher levels of command³. To be sure, the executive leadership of the RCN is almost exclusively the territory of the warfare officers; selected for ever increasing levels of leadership following a path of successive command appointments. So what about the *other* naval officers?

5. Within the current CAF establishment, the NTO trade is currently structured to generate, as a maximum, two officers at the rank of Commodore; one, a Director-General leading the Maritime Equipment Program Management organization (DGMEPM) and the other, the Project Manager of the Canadian Surface Combatant Project (PM CSC)⁴. This top-end obligation effectively bounds the magnitude of the NTO officer corps as governed by the Military Employment Structure Framework⁵ and endorsed by Commander RCN (CRCN) as the Occupational Authority for trades assigned to the RCN “[...] for the purpose of providing combat capable general purpose maritime forces.” However, unlike NWOs, once posted ashore for the final time, an NTO, typically a newly promoted Lieutenant-Commander (LCdr), does not have a clear path to advance along, or deviate from. Instead, they enter a sort of professional estuary, where the path to the highest ranks within the occupation do not necessarily pass through successive command appointments. Herein lies a central challenge for the NTO occupation; defining what, if any, are the essential competencies that members should strive to embody in order to

³ E.g. the Fleet (Commodore), Formation (Rear-Admiral), and the Navy (Vice-Admiral)

⁴ Interestingly this officer works as a Director, normally a classification equivalent to a Capt(N)/Col.

⁵ National Defence, "DAOD 5070-1, Military Employment Structure Framework,"

<https://www.canada.ca/en/department-national-defence/corporate/policies-standards/defence-administrative-orders-directives/5000-series/5070/5070-1-military-employment-structure-framework.html> (accessed May 1, 2022).

fulfill those senior positions, and establishing how are they systematically inculcated and reinforced throughout the member's career?

6. As stated above, the aim of this paper is not to argue for revolutionary change within the occupation. Rather, to answer the question –for a given set of institutional constraints, what factors dictate how the leadership of the naval technical community *should* be employed to optimally support the mandate of the CAF mission? To do so, it is important to first understand how functional authorities for CAF materiel acquisition and support are centralized under the Assistant Deputy Minister (Materiel) or ADM(Mat).

7. ADM(Mat) is a senior public servant who reports directly to the Deputy Minister (DM), and who's organization, referred to fondly as the *Mat Group*, employs a significant workforce of defence practitioners (approximately 3220 civilians and 1380 military personnel) with an allocated annual budget of over \$6B to execute their mandate of procurement and management defence equipment and materiel.⁶ In his 2009 article in Canadian Policy Journal, Philippe Lagassé, presents the historical context behind the creation of National Defence Headquarters (NDHQ) by the Trudeau government in 1973 including the position of Deputy Minister and several Assistant Deputy Ministers (ADM), one of whom was to be responsible for defence materiel. He writes that the creation of ADM responsible for Policy (Pol) and Materiel (Mat) “[...]were particularly important to the civil military relationship. Establishing these ADMs transferred the formulation of defence policy and the management of defence procurements to civilian defence experts

⁶ National Defence, "Assistant Deputy Minister (Materiel)," <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/transition-materials/defence-101/2020/03/defence-101/adm-mat.html> (accessed May 3, 2022).

[...]”⁷. He goes on to explain how these organizations were expected to provide Cabinet with alternative options on matters of defence policy and procurement, relative to those given by military leadership.

8. That many of the same roles and structures still exist in today’s Department is a testament to the insights of those past defence leaders. However, the melding of bureaucratic and military operational-strategic organizations and functions is complicated business and there is likely never a perfect solution. As far back as 1980, the Review Group on the Report of the Task Force on Unification of the Canadian Forces generally endorsed benefits and efficiencies realized from the centralization of support services, including materiel management and procurement, but dedicate an entire section (Part 3) of their report to concerns around “civilianization” of military staff within the National Defence bureaucracy. They follow in the section addressing support services (Part 5) with the cautionary note that “[..] every effort continue to be made within the Department to develop and maintain environmental expertise within the Support Services.”⁸

9. More recently, in 2005 the CDS Action Team 1 report (part of CDS Gen Hillier’s CAF transformation initiative) wrestled with similar issues observing that the “integrated structure of NDHQ sees similar DND and CF functions grouped together, and therefore many CF functions are under civilian control” pointing to a natural bias for “functional service delivery over operational mission output.”⁹ This *civ-mil* dynamic is central to the

⁷ Philippe Lagassé and Joel J. Sokolsky, "A Larger "Footprint" in Ottawa: General Hillier and Canada's Shifting Civil-Military Relationship, 2005-2008," *Canadian Foreign Policy Journal* 15, no. 2 (2009), 16-40.

⁸ J. E. Vance, Canada. Dept. of National Defence and Canada. Review Group on the Report of the Task Force on Unification of the Canadian Forces, *Review Group on the Report of the Task Force on Unification of the Canadian Forces: Report, 31 August 1980* (Ottawa: Dept. of National Defence,[1980]).

⁹ Canada. Chief of the Defence Staff. Action Team, 1, *CDS Action Team 1 Report* (Ottawa: Dept. of National Defence,[2005]). <https://go.exlibris.link/YCBhGmqR>.

thesis of this paper because the Mat Group is where fully one third of NTOs at the rank of LCdr and Cdr, two thirds of the trade's Capt(N) and both Flag Officers work at any given time¹⁰. The key observation here is that the senior leadership of the *other* naval officer occupation resides permanently outside of RCN lines, indeed outside CAF lines. For an institution where the chain of command and (military) unit cohesion are often cited as critical for operational output, the executive leadership of the Navy should have a coherent explanation regarding why this dichotomy in its officer corps exists, the potential institutional risks posed by the split, and strategy of how they are mitigated. On the other hand, if the status quo employment model of NTOs is simply the result of a pragmatic approach to group personnel with similar functional outputs in order to meet (fully justified) government mandated efficiency targets, there is a high likelihood that some important particularities of military service are not fully and accounted for in the structure.

DISCUSSION: FACTORS AFFECTING NTO EMPLOYMENT

10. With the previous section as context, this section will examine the employment of senior NTOs relative to three broad themes foundational to employment senior officers: relationship with the chain of command, operational and cultural relevance, and professional orientation.

Relationship with the Chain of Command

11. The relationship with the 'chain of command' can be looked at in two ways. First, as CAF officers, NTOs are unambiguously, at all times, nested within the CAF chain of

¹⁰ *Military Administrative Support System (MASS)* (Ottawa: , 2021).

command, under the full command of the Chief of the Defence Staff (CDS). Despite this fact, once they leave the operational fleet, senior NTOs can expect to spend the bulk of their career in positions within the Mat Group, where leadership and management functions are largely dislocated from the command authorities. The Mat Group is an excellent work environment comprised of skilled professionals who work to progress a vast range of engineering and logistics activity. However, as a large matrix organization of civilian and military staff, a member's supervisor (civilian or military) providing direct leadership and management functions for their section/directorate is not likely to exercise command authorities over those subordinate military members. Authority of a Commanding Officer (CO) is likely to be held by an officer at a sufficiently high level within the organization to assume responsibility for a suitable number of CAF members within the organization under them (i.e. CAF members within the Mat Group are dispersed throughout various directorates vice organized in a unit construct) with relatively limited direct influence on the day to day work of their subordinate CAF members. This *matrix command* model, not uncommon in many headquarters, is replicated for the higher authorities of Commander Commanding a Command where a General/Flag Officer (GOFO) at a sufficiently high level assumes command responsibilities for all military members of within the Group (as the organization is headed by a civilian, they cannot assume command over military members), as opposed to the Directors General who are generated from each service (for personnel supporting naval materiel and projects, DGMEPM) who provide direct leadership and management

for the personnel working in their respective Equipment Program Management (EPM) organization.¹¹

12. Another facet of NTO's relationship with Command is the imperative (or lack thereof) to take on Command appointments as a LCdr or Cdr. To be sure, there are a number of Commanding Officer roles that are normally or periodically held by talented NTOs, but it is not clear (not formally stated) whether achieving the rank of Capt(N) and beyond is predicated on the capacity to successfully exercise unit or sub-unit command as is the case with the warfare community as they advance in rank. Despite the pragmatic reasons for this differing relationship with Command, the potential effects are important to recognize. If an NTO spends most of the second half of their career in the Mat Group, this dislocation may become internalized with the effect of diminishing the perception of the importance of Command authorities to subordinate members. Officers in the CAF spend their early years laser-focused on their CO's orders, direction, and intent to focus their professional energy. If junior NTOs do not regularly see their most talented senior members exercising command authority (at all, let alone over them), within the RCN chain of command, they could be forgiven for drawing the conclusion that is not a central tenant of their employment as a CAF officer. This is not a healthy perception for a junior officer to have, or for a senior officer to reinforce.

¹¹ An interesting aspect of the relationship to command that is not explored in here in detail is the secondary title "Chief Engineer of the Navy" assigned to DGMEPM. This is a clear effort to reinforce the linkage to the RCN Command structure and Naval Staff governance bodies. How such "double hat" positions could be employed, including delegation of various command authorities, is worthwhile of additional considerations as the NTO occupation evolves.

13. Far from an indictment of those military leaders within the Mat Group, it may be that Command is not an essential feature of such an organization. As Dr. Alen Okros clarifies in his 2010 monograph on leadership:

“Of importance in differentiating the goals of command and management, management is usually based on a formal statement of work outputs or work outcomes (as in most business plans) while command is based on much broader statements of generalized effects to be created as a result of ‘work activities’. As an extension, it should be noted that a core element of business plans is to ensure the manager has sufficient allocated resources to achieve mandated outputs or outcomes. This is not a ‘given’ for Commanders, they are usually expected to improvise and may, on occasion, have to independently amend actions, outputs, outcomes or even the effects created.”¹²

If the leadership and management imperatives within the Mat Group do not imply the need to be fused under command authorities / relationships, then those exercising command within the Mar Group do so more for administrative coherence (for the military members under them) than to satisfy the traditional imperatives of military Command. As a result, Occupational Authorities should give careful consideration to who is posted there, why, and for how long.

Operational & Cultural Relevance

14. NTO senior leadership regularly state that postings to operational units during the first half of an officer’s career form a critical body of knowledge and experience

¹² Alan Charles Okros and Canadian Forces Leadership Institute, *Leadership in the Canadian Military Context* (Ottawa, Ont.: Canadian Forces Leadership Institute, [2010]). <https://go.exlibris.link/4mNrdt9t>.

regarding naval operations and leadership, as well as fostering a bond of trust with NWO counterparts that will endure throughout their career. Using the shorthand term, *credibility*, this effect of shared experience and trust between senior naval officers from the technical and operational communities, even when not working in close proximity organizationally, is cited as critical to the legitimacy and coherence of the naval MA&S work that happens within the Mat Group. The logic follows that if that credibility of NTOs relative to NWOs¹³ does not exist, then the coherence of the work relative to the needs of the RCN would decrease.

15. Much like the issues related to Command, this logic and approach is not inherently problematic, but could be depending on how a career actually plays out over time. The challenge senior NTOs may need to contend with is that their experience in the operational fleet becomes less relevant with the time between their last postings to an RCN formation or headquarters. Like all organizations, the RCN is continually evolving its force structure, training programme, and operating concepts in response to changing government demands on its operational forces. With these changes, the culture of the RCN also evolves writ large. It is entirely possible for an NTO to complete their HOD tour and spend a decade or more working within the Mat Group, rarely engaging closely with the operational fleet, and relying on an ever-more distant set of shared experiences with their warfare counterparts, not to mention the NCMs of the *hard sea-trades*, who rarely spend more than one of two posting cycles detached from core navy business – rarely isolated from evolving navy culture. The result is an ever-widening *culture gap* that

¹³ Interestingly, when discussing this relationship, this term is never applied in the opposite direction.

may erode the tenuous concept of credibility on which the NTO occupation places much emphasis.

16. The fact that this social dynamic might not have been taken into account by the architects ADM organizations is not surprising but could have real effects as alluded to earlier in the 1980 Unification Report. In more contemporary academic literature, looking at how military members have reacted to the past major DND transformations, Dr. Eric Ouellet and Maj Devin Conley describe Regulative, Cognitive and Normative *pillars* from which institutions derive legitimacy. They describe the Normative Pillar as being:

“[...] based on the norms and values found within an institution that prescribe behaviour in order to maintain social cohesion and order. Values define the desirable ideal against which behaviours can be measured. Norms, on the other hand, represent the actual actions of individuals and activity patterns that are enacted because of the social pressures linked to abiding to institutional values.

[...] As a secondary, but crucial order of effect, norms and values also underwrite the members’ deep sense of identity.”¹⁴

They conclude by asserting that change initiatives in military organisations often discount non-rational factors, ones related to the elusive concept of effectiveness vice those leading to increased efficiency, which can prove more important than civilians leaders likely perceive.

17. It seems clear that the concept of credibility between the occupations is related to the normative institutional pillar described above and is intended to drive and maintain military effectiveness within a civilian dominated organization. However, the description

¹⁴ D. Conley and E. Ouellet, "The Canadian Forces and Military Transformation: An Elusive Quest for Efficiency," *Canadian Army Journal* 14, no. 1 (2012), 71-83.

in the article suggests that these normative social forces operate when continuously reinforced, rather than based on a discrete period of close contact that persists into the future. Therefore, this credibility linkage may not be as robust as current discourse suggests. Perhaps even more importantly, in a period of unprecedented culture change and coupled with post-pandemic CAF reconstitution, a large sub-set of naval officers are not fully engaged in (re)establishing a healthy *normative institutional pillar* needed for the RCN to recover from the ongoing leadership crisis related high profile cases and systemic provenance of sexual misconduct in the operational fleet.

Professional Orientation

18. The NTO occupation succeeds in generating extremely competent officers who fill many critical roles within the naval MA&S enterprise, helping to bridge the gulf between RCN operational requirements and the machinery of the Department, Government and industry. This is a massive challenge and a top priority for ADM(Mat):

“The Materiel Group is challenged to fully execute Strong, Secure, Engaged [sic] due to insufficient workforce capacity and capability. Our skilled workforce is aging, and we are facing strong competition from the private sector for the scarce specialty engineering and defence procurement talent.”¹⁵

This pressure is exasperated within the trade because vacancies (or unfilled growth positions) in the public service within the Engineer (ENG) classification register as viable opportunities for NTOs to retire into, then to perform similar work, while isolated from the constraints of military service, and collecting a military pension in addition to their

¹⁵ Defence, "Assistant Deputy Minister (Materiel)," <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/transition-materials/defence-101/2020/03/defence-101/adm-mat.html> (accessed May 3, 2022).

new salary. As a result, the occupation is perpetually short staffed relative to preferred *manning* levels (PML) and available establishment positions.¹⁶ If the solution to this paradoxical supply/demand problem is not entirely clear, at the very least, it highlights the imperative to employ NTOs to the greatest possible effect. It also suggests that the amount of functional overlap with civilian engineers matters, in that too much similarity effectively erases many of the implications related to the decision of an NTO to retire, effectively reducing the choice to a purely financial one.¹⁷

19. To this end, professional orientation is intended to mean the way an officer is likely to approach and engage with work challenges –what analytical tools and professional frameworks accumulated over a diverse career they have to draw on to help address the RCN’s challenges. Within the Mat Group, there is a strong push to improve acquisition outcomes and throughput by professionalizing and formalizing the workforce’s acquisition skills¹⁸ including a bespoke Project Management Competency Development (PMCD) program, closely aligned with the industry standard PMI framework¹⁹, whereby staff members of different backgrounds can develop formally recognized PM skills and experience tailored to the Government of Canada project

¹⁶ *Military Administrative Support System (MASS)* (Ottawa: , 2021).

¹⁷ An idea discussed informally within the occupation and not explored in this paper is that the NTO occupation is to a certain extent employed as such in order to force generate highly qualified public service engineers benefit from the experience of military service, but enjoy the stability can therefore develop deep, niche expertise within the Mat Group. This would suggest the need to actively manage the careers of NTOs, not just up to the point they retire, but treat the transition of into the public service as a formal career stream.

¹⁸ National Defence, "Materiel Acquisition and Support Officer Development Program," <https://www.canada.ca/en/department-national-defence/corporate/job-opportunities/civilian-jobs/civilian-job-opportunities/students-and-new-grads/materiel-acquisition-support-officer-development-program.html> (accessed May 5, 2022).

¹⁹ "Project Manager Competency Development (PMCD) Framework." <https://www.pmi.org/learning/library/project-manager-competency-development-framework-7376> (accessed May 2, 2022).

structure²⁰ military members within the Group have full access to much of this training and are encouraged to work towards successive PMCD qualification levels. As an employee gains project knowledge and experience they gain access to more senior management roles within increasingly complex projects. To date hundreds of candidates have achieved various PMCD qualifications and the Project Management Professional (PMP) designation is a common addition to the email signature blocks of DND project staff. But is an orientation toward PM the optimal way to leverage unique NTO skills and experience?

20. This direction has certainly been supported by various defence experts but these assessments are often made with a department or government-level point of view and so can miss the level of granularity that would point to specific competencies that might be deficient or missing. In his succinct CGAI essay, David Perry astutely points to numerous shortcomings in the Government's ability to procure military hardware and suggests several ways that the public service and elected officials might increase performance²¹. However, the solutions related to capacity are too vague to be applicable to the NTO trade. The suggestion that more, and more competent *acquisition specialists* would help the situation is inevitably true, but leaves many unanswered questions: Who are these people, what are their specialties, where in the project are they needed, is there an implication for CAF technical officers, and are there activities outside the ADM(Mat) mandate that would affect performance?

²⁰ National Defence, "Defence Purchases and Upgrades Process," <https://www.canada.ca/en/department-national-defence/services/procurement/defence-purchases-upgrades-process.html> (accessed May 2, 2022).

²¹ David Perry, *Fixing Procurement* Canadian Global Affairs Institute, 2016).

21. DND acquisition projects run by ADM(Mat) invariably deliver complex military equipment to satisfy operational requirements resulting in CAF capabilities mandated by the government. The practice of “transform[ing] a set of customer needs, expectations, and constraints into a solution”²² happens within a project construct, but is not itself project management (or procurement) per se; its systems engineering. Although the two practices, PM and SE, are tightly coupled in these projects, to conflate them is to miss an important distinction concerning the employment of engineers. It may be desirable to have a senior engineer lead a highly complex equipment project, but project management as a professional orientation is agnostic to the technical solutions delivered and should not be seen as home turf for NTOs. With these distinctions, these procurement challenges can be articulated in greater detail.

22. By the time the public perceives that an acquisition is in *trouble*, it is likely that the project is in the Definition or Implementation phase, meaning there is a robust project management office (PMO) spending vast government funding and, depending on the project structure, an upcoming milestone likely involves approval for expenditure authority for the procurement of the new system from a compliant vendor. Projects tend to enter the public consciousness at this point because this is when the highest fidelity estimates for cost, schedule and scope are needed, both by Treasury Board who will approve the expenditure, and by the potential vendors who evaluate the technical requirements for the system with a view to bidding on and winning the contract. At this point, any faulty assumptions, missing analysis, or ambiguous/conflicting

²² SEBoK Editorial Board, *The Guide to the Systems Engineering Body of Knowledge (SEBoK)*, ed. Cloutier R.J. (Editor in Chief), 2.5th ed. (Hoboken, NJ: The Trustees of the Stevens Institute of Technology., 2021), 1-1155.

requirements/standards will become glaringly obvious to the stakeholders outside DND and often result in significant impacts on the project budget and schedule. With that said, *better project management* is not necessarily the solution for underperforming projects. It is important to determine from where the issue was generated and what competencies would have addressed it...and when.

23. While high quality project management is essential for major defence procurements, there are ways that projects can fail that lie outside the purview of PM. For example, on the front end of acquisition projects, the myriad of activities including Capability Based Planning (CBP), Force Development / Management assessments and modeling, and decisions regarding high level requirements during the project Identification & Options Analysis phases all serve to define and constrain the technical requirements that will form the basis for initial cost and schedule estimates and eventually need to be realized by an industry contractor. If any of these inputs into the project are incoherent, incomplete, inconsistent, they could easily result in hidden project risks that are not realized until the later phases when the impact of resolving them can be astronomical. And very public.

24. The first iteration of the Joint Support Ship Project²³ may be a prime example where the high-level attributes of the desired ship were likely unachievable due to technical complexity and lack of a functioning shipbuilding industry in Canada, even if managed by skilled PM practitioners.²⁴ Front-loading NTO resources during these early acquisition activities before a major capital project is approved to spend vote 5 funding is

²³ Sharon Hobson, "Canada Gives Green Light for Joint Support Ship Project," *Jane's Defence Weekly* 41, no. 21 (2004), 31.

²⁴ Sharon Hobson, "Canada Cancels Support Ship Procurement," *Jane's Defence Weekly* 45, no. 37 (2008), 10.

a significant challenge but could serve to avoid some of the most significant risks to a project; ambiguous linkage between approved military capabilities, and project requirements.

25. If this framing of PM vs. SE skill-sets is accurate, it suggests a shift in the order of precedence of technical competencies needed by NTOs and when they are needed in the acquisition process. The decomposition of military capabilities, to operational requirements, and subsequently technical requirements, including external dependencies for all PRICIE+G elements, is work that can be greatly improved by the rigors of formal systems engineering (SE)²⁵, not project management. These early stages of the acquisition process may actually be the *vital ground* for the NTO trade in its current manifestation. A recent Review Services Evaluation of Naval Force Development (NFD) makes several recommendations that indicate the complexity and magnitude of this work needs to be bolstered by more staff with formal competencies in Force Development.²⁶ As the organization providing the *raw material* for major acquisition projects, a systems engineering orientation within Naval Staff could work to address downstream project issues. The confluence of early operational experience followed by deeper institutional understanding sees the NTO trade positioned to take a much more prominent role in defining the RCN of the future. To achieve this outcome, NTOs would likely need to increase and formalize their SE competencies in a similar way that the Mat Group has in

²⁵ SEBoK Editorial Board, *The Guide to the Systems Engineering Body of Knowledge (SEBoK)*, ed. Cloutier R.J. (Editor in Chief), 2.5th ed. (Hoboken, NJ: The Trustees of the Stevens Institute of Technology., 2021), 1-1155.

²⁶ National Defence, "Evaluation of Naval Force Development," <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/evaluation-naval-force-development.html> (accessed May 4, 2022).

the PMCD framework,²⁷ and potentially earlier in their career. Conversely, acquisition projects led from within the Mat Group may benefit from a more diverse set of project professionals such as officers from the operational trades whose career stream does not typically include high profile project management positions.

CONCLUSIONS AND RECOMMENDATIONS

26. This paper has examined the employment of NTOs relative to three different themes; Relationship to the Chain of Command, Operational & Cultural Relevance, and Professional Orientation. In doing so, we can see that there are aspects of how and where NTOs are employed which may be incoherent with the expectations of military service or undermine their capacity to carry out their essential functions –to sustain the RCN or today and deliver the RCN of the future. To recap, we have seen that:

- a. The occupation does not use unit or sub-unit command as a verification / validation of a member’s leadership potential, while spending much of their career in an organization where direct leadership and management authorities are largely dislocated from those exercising the fundamental military tenant of command. This can lead to a cognitive dissidence where a significant portion of naval officers do not see command as a fundamental aspect of their profession;
- b. The trust and shared experience that the NTO trade holds as a valuable institutional commodity, credibility, is not necessarily a fixed quantity and

²⁷ "INCOSE Competency Framework." <https://www.incose.org/products-and-publications/competency-framework> (accessed May 3, 2022).

can degrade if officers lose touch with the evolving operational and cultural context within the RCN; and

- c. The recent professionalization of PM within the Mat Group should not necessarily be the core professional orientation for NTOs. As military officers and MA&S professionals, NTOs may have the greatest positive effect on project outcomes if they are employed increasingly in the nexus *between* CBP and the project definition phase.

27. The scope of this paper does not allow for the deep analysis needed to present concrete, evidence-based solutions for how employment of NTOs should be optimized based on these conclusions. However, based on this re-framing, the following recommendations suggest specific areas for future analysis that will inform planning and decisions related to the future direction of the occupation.

Wider Employment of NTOs within Naval Staff Headquarters (NSHQ)

28. NTO employment related to MA&S within the Mat Group establishment should be by exception rather than the rule. There are numerous jobs that should be staffed by NTOs either because the role is best executed from the perspective of a CAF officer (vice member of the public service), or because the role offers the officer a unique and essential learning experience within the MA&S enterprise. Outside of those criteria, the core work of NTOs should take place within an RCN organization / establishment positions where the currency of operational credibility is not only leveraged daily, it remains current and affords the officer to play a direct role in shaping the culture of the RCN in a two-way exchange. This shift also has the effect of shifting the work of NTOs toward the earlier stages of new capability acquisition including CBP, NFD, and project ID and OA phases

where major project risks can be mitigated through early and robust analysis and careful requirements decomposition.

Formalize Systems Engineering Competencies Early in the Career Stream

29. Junior NTOs will benefit from the coupling of their early operational experience with formal SE competency development based on industry best practices. Adopting such a framework, as is currently being instituted in the Australian Defence Force²⁸, would create a powerful orientation toward the nuanced relationship between operational capabilities, technical requirements, and sustainment activities, and test and trails regimes. Far from obviating the benefits of the successful PMCD program, NTOs entering key postings within the Mat Group would approach their project management training, not as an agnostic management framework mandated by Treasury Board, but as the way to resource, fund, plan, and execute the critical SE activities needed to acquire and operationalize new military capabilities.

Resolve Ambiguity Related to Command Positions

30. To be a credible partner in the sea operations branch, the NTO occupation must resolve the ambiguity around the imperative to attain command at the LCdr and Cdr ranks and increase representation within the Naval Staff chain of command. It is recommended that unit command (as a LCdr or Cdr) be formalized as a criterion for progression in rank. In addition, the possibility of more NTOs being employed at the rank of Capt(N) and

²⁸ Peter W. Beven, Luke Brown and Jo Dawson, "A Competency Model in Systems Engineering for the Australian Department of Defence," *Australian Journal of Multi-Disciplinary Engineering* 15, no. 1 (2019), 44-51.

above within NSHQ while trading off in-kind opportunities for senior warfare officers within the Mat Group including project manager should be considered.

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