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ENGINEER TECHNICAL AUTHORITY: PUSHING POWER TO THE EDGE ON DEPLOYED OPERATIONS

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AIM

1. The aim of this service paper is to discuss military engineer technical authority on deployed operations and to provide recommendations how Canadian Joint Operations Command (CJOC) can exercise this authority more effectively. The paper will look at the problem through the "power to the edge"[1] command and control concepts from books written by David Alberts and Richard Hayes. In this same light, further azimuth will be provided by the reflective guidance of Commander CJOC from his letter titled "How We Fight: Commander CJOC's Thoughts". It will provide analysis and recommendations on how to force generate the technical authority, how to set the conditions for their success at the operational level and how to develop the technical support structure.

INTRODUCTION

2. Technical authority is not a uniquely military engineer concept but it is within the Canadian Military Engineer (CME) community that the concept is most debated and scrutinized. The (draft) joint doctrine on military engineering describes the current understanding of what technical authority means to military engineers and also how it relates to *Technical Control*:

> Authority may be embodied in an engineer commander or a key engineer staff appointment. Technical authorities for specific engineer functions and sub-functions are specified in writing for each operation. Technical authority, as is true for command, implies an element of control: the ability to exercise *technical control*. The key difference between technical authority and technical control is that the former allows for the setting of

[1] Alberts, David S., and Richard E. Hayes. "Power to the Edge: Command and Control in the Information Age." *Command and Control Research Publication Series (2005).*

> policies and standards, while the latter is focused on ensuring that the policies and standards are applied.[2]

The technical authority as an individual is the "person who has the authority to set technical specifications and standards, manage configurations, provide technical advice and monitor compliance within their area of responsibility."[3] These descriptions will not be challenged in this paper but will be the start point for further discussion. It's the who, when, where and how of its application that will be of interest.

3. Technical authority does not fall along the same lines as command authority, which of course is the primary authority on a deployed operation. Technical authority rather, compliments and supports command authority. It places responsibilities on those who are the identified as technical experts in their trade to advise commanders and to make decisions that are very technical in nature. Practically speaking, for engineers, this means being empowered through their technical chain of authority to make decisions that may have significant risk associated. This is particular evident in the execution of technical authority within the realm of deployed infrastructure design and construction. It is the engineer that is responsible to review construction designs, supervise and inspect construction work, and to ultimately ensure the integrity of the infrastructure and safety of soldiers and public who will use it. In the Canadian domestic infrastructure and domain there may be dozens of engineers, architects and technical experts involved in a construction project to ensure public safety and compliance to established codes. On a

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[2] Department of National Defence, CFJP 3-12, *Military Engineering in Joint* Operations (Ottawa: DND Canada, unpublished), 2-6.

[3] Defence Terminology Bank, record 43437. According to TERMIUM Plus, the context for technical authority includes project authority or work authority and means the person designated in the contract, or by notice to the contractor, as the asset manager, who shall act as the representative of the minister in matters concerning the technical aspects of the work.

deployed CAF operation, however, similar responsibility often falls to only one or a handful of engineer officers of no certain engineering competency. On top of this, deployed engineers are normally pressed by their commanders to get results faster, cheaper and with fewer human resources. This is just one example of why the CME corps places such importance on technical authority and also a reason why this authority has increasingly been held centralized.

4. The issue then is whether technical authority is being managed appropriately by the CJOC Joint Engineer (JEngr), who is the operational level technical authority and is responsible for "exercising technical authority and technical control for military engineering on operations."[4] The question from CJOC specifically reads:

> How do Command-level advisers ensure that technical authority is given on behalf of Comd CJOC or to competent and capable technical experts in the fields required and expected of a mission, while ensuring the TF Comd and Comd CJOC are protected should the advisor not be fully competent? What should be the minimum level of knowledge and experience required to fulfill the duties of a technical authority? If no one with the appropriate knowledge and experience is available, should technical authority be restricted and if so, how and to what extent?

The answer to that needs to be explored through the reflective guidance of the current Commander of CJOC, LGen Rouleau from his letter "How We Fight: Commander CJOC's Thoughts". Rouleau provides two specific guiding concepts that will applied to the problem. First, Rouleau speaks to delegations when he say: "smartly tailored

[4] Department of national Defence, CFJP 3-12, *Military Engineering in Joint* Operations (Ottawa: DND Canada, unpublished), 2-7.

authorities and crystal clear permissions are crucial to mission success in the grey zone"[5].

He later offers that:

> We must push power to the edge more - as a function of expertise (the best information is generally known lower), outcomes (every relay doubles the noise and cuts the message in half), and necessity…[6]

The following discussion will look at the problem a little closer and then explore just some of the factors that may lead to a solution.

DISCUSSION

Technical Risk Factors

5. CJOC JEngr has been closely tracking a number of what many consider to be technical failures in recent operations. The prime examples of this have been within the domain of electrical generation and electrical distribution work, where CJOC JEngr has logged a database of eleven different electrical incidents since 2012.[7] These incidents have resulted in serious injuries in some cases or significant property loss in others[8]. These incidents, among others, placed pressure on CJOC JEngr to tighten up their controls to prevent further incidents and loss. Centralization of technical authority went from simply executing authority over operational level matters to having CJOC Staff officers review tactical level engineer work. One particular example of this was during the theatre opening of Op REASSURANCE in Latvia in 2017. The Joint Task Force

[5] Lieutenant General Mike Rouleau, *How We Fight: Commander CJOC Thoughts*, 10 Feb 2019, 7.
[6] *Ibid*., 7.
[7] Maj T. MacLeod, telephone conversation with former CJOC JEngr Readiness-1, 24 October 2019.
[8] Maj T. MacLeod, Deployed Engr Lessons Observed Op REASSURANCE - Adazi, Latvia - Failure of Electrical Generators, 14 February 2018.

Support Component (JTFC) Engineer, tasked with designing and managing the construction of infrastructure required to support the operations, was directed to send engineering designs to the JEngr for detailed technical review as the technical authority. These design reviews imposed moderate delays and created significant friction between the deployed engineers and the operational level staff[9]. These particular examples provide context into the question on technical authority from CJOC and demonstrate the how much can be done to improve the situation.

Force Generating the Technical Authority

Technical Authority Across a Broad Spectrum of Engineer Tasks

6. Military engineers on operations fulfill many different tasks and roles; making the problem space of engineer expertise or technical authority quite large. The roles and tasks across the CME have become so broad that it has become impractical to expect hat any one person of the same rank could manage technical authority. After completion of basic officer and trade training, both Army and Air Force engineers can be assumed to have reasonable expertise in overseeing their traditional tasks. The more specialized roles such as Counter Improvised Explosive Device Disposal (C-IEDD), Explosive Ordinance Disposal (EOD), fire protection, horizontal construction and vertical construction are more challenging. There are fairly well-established specialty training and authorities for EOD and fire protection roles. Just having qualified officers and NCMs in a deployed organisation can provide suitable baseline expertise in many cases.

[9] This is an account of events from the author's perspective who was a non-deployed third party to the events briefly described.

Horizontal and vertical construction and infrastructure management however is where the most issues arise in technical authority because of an overall lack of technical expertise and experience in the CME. The appropriate technical competency required to authorize deviations from code in electrical distribution projects, for example, is not clear. The risk associated with electrical incidents, however, warrants a high level of fidelity and risk analysis. The required depth of training and expertise required to exercise sound technical authority on operations challenges the notion that it can be effectively overseen by a single individual. This forms part of the justification for centralizing technical authority at CJOC, where staff can seek out the appropriate advisers to inform a decision by the CJOC JEngr. The default decentralized approach is to deploy each task force enabled with expertise representation from each of the engineer capabilities. This however is problematic due to restraints on the size of the engineer organisation and the availability of these persons. A more agile approach is found somewhere in the middle.

Training the Technical Authority

7. There is no training in the CAF that specifically qualifies an officer or non-commissioned member (NCM) to be a technical authority. The JTF Engineer is assumed as a generalist and is expected to manage the specialists that they are given. When higher authority or assistance is needed, they go to CJOC JEngr on the "tech-net". In many cases, this is manageable and respecting the guidance of LGen Rouleau CJOC should aim to place trust in deployed engineers to succeed in their missions. In the interests of reducing the risks of failures however the CME corps can do more to prepare its officers for success.

8. As a start point, one can look at the civilian engineer and the requirements to become licenced as a Professional Engineer (P.Eng.). To become a licenced P.Eng. with Professional Engineers of Ontario (PEO) the applicant must:

> hold an undergraduate engineering degree; successfully complete PEO's Professional Practice Examination (PPE); and demonstrate at least 48 months of verifiable, acceptable engineering experience[10].

Although it would be ideal for all engineers to hold a civilian licence, the requirement to achieve verifiable experience can be difficult to achieve in the military. What is achievable in the CME corps is some form of the Professional Practice Exam (PPE). In most provinces this exam is taught and examined in two parts. The first is a professional practice and ethics exam and the second an exam on engineering law and professional liability[11]. Considering this as a concept, CJOC could require that a technical authority hold an engineering degree and pass a CAF version of the PPE. This would be a positive step toward preventing critical mistakes in engineering judgement and safety.

The Project Oriented Approach

9. There are situations where a single project or group of projects is so complex and resource intensive that it makes sense to force generate a project management team with all of the required expertise to focus on the sole requirements of the project. This was the case and approach taken for the Task Force Latvia Multinational Headquarters project. In this example a project director, project manger and specialist design team from 1

[10] Association of Professional Engineers of Ontario, *Licensing Guide and Application for Licence*, May 2019.
[11] Profesional Engineers Ontario, Professional Practice Exam, Last accessed 24 October 2019. http://peo.on.ca/index.php?ci_id=2060&la_id=1

Engineer Support Unit (1 ESU) were all force generated for this project and given specific technical authorities in writing from CJOC. This has proven to be a very effective approach that could be considered a best practice going forward. It's key limitation however, is that it draws on a very finite set of specialist resources from 1 ESU, which is not sustainable unless 1 ESU is afforded more capability[12]. There is a hybrid approach to this to consider; provide project specific ARAs in writing for all "high risk"[13] projects, but assign the project management structure within the deployed organisation.

Setting the Conditions for Success

Establish Authorities and Push Power to the Edge

10. Despite the importance engineers place on assigning and controlling technical authority what is consistently lacking in recent operations is a clear understanding between the operational and tactical level of risk and division of responsibilities and authorities. To set the conditions for success from the outset of a mission a detailed authorities, responsibilities and accountabilities (ARA) matrix is needed. These ARA need to be supported by mission analysis and deliberate risk analysis in order to generate a mutual understanding of risk between higher and subordinate technical authorities. This process can likewise be repeated at each level of command or authority. This will empower the deployed technical authority, while also managing risk for the Task Force

[12] Note that 1 ESU has a CJOC supported DTEP submission for a fourth Specialist Engineer Team (8 positions)
[13] Note. There is no definition or guidance on how to identify and classify risk in an engineer project. This is an area worth exploring further.

Commander. Where risks are deemed manageable, the ARA matrix should bias towards downward delegation and provide a JTF Engineer the flexibility to further delegate responsibilities. This will support linking authority to where the best combination of expertise and situational knowledge is found.

Establish Operational Guidance and Engineer Mission Framework

11. As the Latvia JTFSC example highlights, issues arise when the boundaries between operational and tactical level activities are blurred. The activities within close and general support engineering, including engineering design, construction and infrastructure maintenance, are all tactical level tasks, implying that operational staff should ideally not be directly involved. The CJOC JEngr staff "exist to enable current and future operations" and "will typically be responsible for institutional activities in addition to operations and plans"[14]. Practically when it comes to deployed infrastructure this means that CJOC JEngr effort should be focused on establishing the standards and framework for engineering works and coordinating the financial, equipment and force generation activities required to achieve the tactical tasks. Technical Authority therefore should be exercised at that same level. In the Latvia example again, CJOC was conducting design review but had not even determined the construction codes and law of the host nation, nor established a technical agreement that would have enabled the deployed engineers. Although there is always some risk associated with the technical capacity and competence of the deployed engineer, all will be better served if the

[14] Department of national Defence, CFJP 3-12, *Military Engineering in Joint* Operations (Ottawa: DND Canada, unpublished), 2-6.

operational and tactical levels can respect their "arcs". This means that the operational level, in the interest of "pushing power to the edge", must accept some of that risk; place some trust in the deployed engineers; and, focus on enabling their technical authority with clear authorities, operational direction, and access to specialist capabilities when the deployed capacity is exceeded.

Develop the Support Structure

12. Review of tactical engineer reports and designs by operational level staffs is redundant and only serves to distract staff officers from dealing with operational-level issues. Engineering in a deployed setting always has context and pressures that someone in Ottawa is at risk of taking for granted and as a result pass judgement on an engineering decision out of context. As Rouleau says: "the best information is generally known lower"[15]. There are tactical level units with a mandate for reach-back support, however they too need to be empowered and resourced to manage the load. When it comes to specialist support for deployed infrastructure design and construction, the unit with such a mandate is 1 ESU.

13. 1 ESU has two key challenges to delivering the required quality of reach-back support. The first is the technical capacity of the unit and the second is 1 ESU's operational tempo. Much of the capacity issue was well presented in 2010 in Maj M. Arsenault's Briefing Note (BN) to Commander of Operational Support Engineer Group. In it, Arsenault says: "from a technical capability point of view, 1 ESU is currently a pale

[15] Lieutenant General Mike Rouleau, *How We Fight: Commander CJOC Thoughts*, 10 Feb 2019, 7.

image of what it once was, and more importantly of what the CF expects and needs it to be"[16]. The key capacity recommendations in this were never realised, and in some ways things have actually gotten worse for 1 ESU. The recent down-ranking of the NCM construction engineer trades has significantly reduced the technician expertise in 1 ESU. Compounding the capacity issues is that the very finite personnel resources of 1 ESU have been supporting many operations and many deployments. All of this means that 1 ESU has not been able to provide all the specialist expertise required in a timely or effective manner. Still, 1 ESU is the organisation of choice for infrastructure design and project management support. Developing the 1 ESU capability further would go a long way to supporting technical engineer authority on deployed operations.

CONCLUSION

14. The topic of military engineer technical authority is one that can lead to discussion in topics well outside of those presented in this paper. There is much to be looked at in terms of: what is the state of engineering expertise in the CAF; how are engineers trained; and whether the CME corps should even be taking on the responsibilities that it has. This paper does however provide a start point to developing a coherent plan to deploy competent and well enabled engineers capable of exercising technical authority and control "at the edge". The desired end state is having the right persons in the right places, with the right guidance and authorities and the right technical support structure to ensure mission success and the safety of our soldiers.

[16] Maj M. Arsenault, Briefing Note for Comd OS Engr Group – 1 Engineer Support Unit Capacity & Capability Deficiencies, 19 May 2010.

RECOMMENDATIONS

15. There are many aspects to this issue that need to be explored and analyzed further to come up with a comprehensive solution that truly enables effective technical authority and technical control at the edge. Some broad recommendations are as follows:

a. Select military engineer officers with the best capacity to exercise technical authority over a given mission set and then enable them with detailed operational level direction, clear delegations of authority, pushed information and direct access to reach-back support;

b. Conduct deliberate risk assessments for all projects and where appropriate, assign or force generate project specific authorities who hold the right expertise;

c. Develop a military engineering professional practice qualification that puts deployed authorities in the right ethical and legal mindset;

d. Explicitly assign technical authority to deployed engineers with a detailed ARA matrix in annex EE of the Operations Order; and

e. Address the capacity issues at 1 ESU, specifically the civilian engineer staffing that will provide the required reliable expertise, continuity, and mentorship.

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