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ORGANIC INDIRECT FIRE CAPABILITY FOR INFANTRY BATTALIONS

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ORGANIC INDIRECT FIRE CAPABILITY FOR INFANTRY BATTALIONS

AIM

1. This paper will address the requirement for an indirect fire capability to exist within the organization of the nine infantry battalions (inf bn) of the Canadian Army (CA). While potential indirect fire (IDF) systems and unit structure will be generically discussed with a view to informing future decisions, recommendations as to exact equipment and organization are beyond the scope of this document.

INTRODUCTION

2. The ability for an inf bn to provide integral IDF support, while lacking from current Canadian capabilities, is neither historically unprecedented nor out of line with allied doctrine. American, British, and Australian infantry units all maintain an organic IDF capability within their organizations, whether at unit or sub-unit level.¹ Similarly, until the mid-2000s the CA had maintained an IDF capability at sub-unit level, in the form of the 60mm light mortar. The unit-level indirect capability had been removed in the late 1990s with the reassignment of the 81mm medium mortar to the artillery. This reassignment was completed as part of the CA move to a more modular force structure. The intent of this realignment was that each branch (infantry, armoured, etc.) would provide unique capabilities, with sub-units being aggregated into composite units for force employment based on the individual requirements of a given mission.

3. This paper will first quantify the requirement for an IDF capability within the inf bn through an examination of current inf bn and artillery regiment capabilities and organizations. These will then be examined through the lens of current tactical doctrine and the Army's future

¹ Department of the Army, *FM 3-21-20, The Infantry Battalion*, Washington, D.C.: Department of the Army, 2006, 10-2; Department of Defence, *The Australian Army: An Aide-Memoire*, Canberra: Department of Defence, 2014, 17.

force employment concept to identify current capability gaps. From this examination, potential force structures will be identified, drawing on allied experience; this would allow identified gaps to be addressed. Finally, technological advances which could further enhance an inf bn IDF capability will be identified with a view to optimizing this capability.

DISCUSSION

Indirect Fire Systems

4. Indirect fire refers to a weapon system engaging a target not visible to the weapon operator, due to distance, terrain, weather, or obscurants. While this paper will discuss in system-agnostic terms the IDF requirements for an inf bn, it should be understood that, based on weapons systems currently fielded and in development by allied nations the weapons to provide this capability would, in all likelihood, be a mortar. Current IDF systems can be broadly grouped into three categories: rockets/missiles, howitzers, and mortars. The first group includes systems like the U.S. Multiple Launch Rocket System and are far beyond the required capabilities projected for the CA. Howitzers include systems like the M777; they are currently fielded with artillery units of the CA. They are medium range systems, usually having a range of 20-30km.² The weapons fire large shells at a relatively low angle in order to achieve these ranges. Shells are fired at high velocity and therefore follow a ballistic arc to reach their target. Howitzers tend to be relatively large; they usually require a tow vehicle or they need to be permanently mounted to a vehicle. In contrast, mortars tend to be far lighter systems. While larger systems may be vehicle mounted, all are sufficiently light to be transported by dismounted soldiers. Mortars fire at high angle and have smaller projectiles than howitzers. As a result, mortars have a much shorter range

² BAE Systems, "M777 A5 Datasheet," Accessed 04 February 2016, <http://www.baesystems.com/en-sa/download-en-sa/20151124114311/1434555688552.pdf> ; Raytheon, "Excalibur," Accessed 03 February 2016, <http://www.raytheon.com/capabilities/products/excalibur/>. The M777 has a range of 24km unassisted, 40km using the Excalibur round.

– usually in the area of 5-7km.³ Due to the trajectory of fire, mortar rounds follow a much higher arc when compared with howitzer shells, and are therefore equipped with tail fins to help stabilize their trajectory and help keep rounds on target. This high arcing flight also permits mortars to fire at targets far closer to their position. Based on these characteristics, most particularly range and mobility, mortars are the indirect weapon of choice for an inf bn. However, there is no reason for this to be the case. As a novel system could in theory provide the same type of capability, this paper will avoid defining the need for a mortar, and instead remain focused on a generic IDF capability.

Infantry Battalion Capabilities

5. The previous IDF capability of the CA inf bn existed in the form of light mortars held at the platoon level, and medium mortars held at unit level. As previously noted, the medium mortars were reassigned to the artillery, in order to group all medium and heavy indirect systems with one unit. As a result, no replacement for these systems was fielded to inf bns. With the divestment of the light mortars, however, there was a furtive attempt to maintain some aspect of an IDF capability within the inf bns. This attempt involved the C-16 Close Area Suppression Weapon (CASW). The CASW is a belt-fed automatic grenade launcher primarily intended for direct fire. However, it is fitted with a fire control system (FCS) which allows it, in theory, to be fired indirectly. The FCS uses global positioning system (GPS) signals to determine its location, and when given a target grid, is then able to provide aiming instructions to allow it to fire at the unseen target. With the fielding of the CASW, however, two issues were identified with its ability to fire indirectly, one technical and one conceptual. The technical issue relates to the

³ Government of Canada, "81-mm Mortar," Last modified 06 January 2016, <http://www.army-armee.forces.gc.ca/en/weapons/81-mm-mortar.page>. The 81mm mortar in service with the CA has a maximum range of 5650m.

ability of the system to accurately determine the position and orientation of the system.⁴ While efforts are on-going to rectify this issue, it remains unresolved after five years of work. In the interim, IDF using the FCS is prohibited.⁵ The conceptual issue relates to the intended purpose of the system, and the design of its ammunition. Because the CASW was originally designed to be fired only in the direct fire role (i.e. where the operator can see the target), the rounds were designed to follow a ballistic flight path. Because of this, they are not equipped with tail fins which would serve no purpose in ballistic flight and would only slow the round, decreasing its range. This lack of fins, combined with the very light weight of the round, means that their arc of flight is highly influenced by winds at higher altitude. The end result is that rounds fired indirectly have a very large impact area. This both decreases their effectiveness at destroying the enemy, and increases the risk of collateral damage. While the technical issue may be resolvable, this conceptual issue cannot be resolved in a way which optimizes both direct and indirect fire; the solution for one by its nature will cause issues for the other.

Artillery Regiment Capabilities

6. As currently structured, all IDF assets within the CA reside within the artillery regiments in the form of the M777 howitzer and the 81mm mortar. However, due to doctrine, artillery regiments are not able to operate both systems concurrently. Assuming that correct ammunition is available, the manoeuvre force commander being supported is therefore required to develop a plan which employs only one type of IDF. This choice is further restricted because current artillery tactics are designed such that mortars are only used to provide defensive fires for the

⁴ Specifically, when fired, the magnetic signature of the weapon changes, inducing errors in the on board digital magnetic compass. These errors mean that the weapon will be pointing in a different direction than the FCS believes, resulting in rounds landing in the wrong location. This issue is obviously irrelevant when the system is fired in the direct role.

⁵ Department of National Defence, "CANLANDGEN 023/11 CLS 032/11," Ottawa: DND, 2011, 3.

gun position, and not in support of offensive operations. At a higher level, constraints on IDF also exist due to force ratios. An artillery regiment is structured to field three sub-units, each of which can provide fire support to a manoeuvre unit (infantry or armoured). These sub-units, while assigned to support their manoeuvre units, remain under control of the artillery regiment's Commanding Officer (CO), who may reassign them at any time to higher priority tasks. As the farthest-reaching system within the brigade, the artillery may also be employed directly by the Brigade Commander (Bde Comd) to prosecute deep targets ahead of the manoeuvre units.

Capability Gaps

7. The force employment concept to which the CA is moving is called Adaptive Dispersed Operations (ADO). Based on the Canadian Armed Forces (CAF) Future Security Environment, ADO sees a non-contiguous battle space, with forces dispersed in time, space, and purpose.⁶ Implicit in the concept of geographically dispersed forces is the ability to provide IDF support to each of those dispersed elements. Herein is found the first capability gap within the current organization of indirect resources. Currently, CA brigades are structured with four manoeuvre elements (three inf bns and one armoured regiment), allowing the creation of up to four Battle Groups (BGs). The Bde Comd is constrained, however, as there are only three artillery sub-units to support these BGs as well as engage brigade priority targets. Accordingly, the Bde Comd must either limit their planning to at most three BGs, or accept the risk of not having IDF support for one or more BGs. This lack of support is generally not an issue on a conventional, contiguous battlefield, as all BGs are likely within range of one of the artillery sub-units. With ADO, however, this may not be the case, and as a result, a BG without a supporting artillery sub-unit may not be within range of any IDF support. The existence of an organic IDF capability within

⁶ Department of National Defence, *Land Operations 2021 Adaptive Dispersed Operations: The Force Employment Concept for Canada's Army of Tomorrow*, Kingston: Directorate of Land Concepts and Design, 2007, 17-18.

the inf bns would partially address this issue. While the indirect firepower capability of an inf bn would clearly be less than that of an artillery sub-unit, it would provide the BG CO with the ability to engage targets with something beyond the BG's direct fire systems.

8. In addition to allowing all manoeuvre units to have some degree of IDF support, the inclusion of an IDF capability in the inf bns provides those COs with a guaranteed fire support not available from the artillery. Because the artillery regiment is a brigade asset, it remains ultimately under the control of the Bde Comd. As such, while the Forward Observation Officer (FOO) parties, who coordinate IDF, may be attached to a BG, the guns themselves never will. This means IDF is never guaranteed, as the guns may be shifted to a higher priority target. Because the inf bn's IDF capability would belong to the BG CO, however, it would be guaranteed to remain assigned to whatever target was the priority for the BG. There also exists the potential, based on the doctrine developed, for the BG CO to split the indirect assets to engage multiple targets.

9. The incorporation of an IDF capability into inf bns will also address a capability gap for fighting in urban areas. The CA has identified that future conflict "...will often occur in urban areas, with adversaries taking full advantage of the complex physical ... environments inherent in large, densely populated cities."⁷ Mortars are particularly suited for use in urban areas, as their high angle of fire allows them to fire over buildings which block the ballistic trajectory of direct fire weapons. While it has already been identified that the inf bn IDF capability need not necessarily come from a mortar, the advantage for urban combat if it does is significant. This is particularly true as the current role of gun line protection filled by the mortars means they would potentially not be available for use in support of a BG in an urban fight.

⁷ *Ibid.*, 4.

Organizations

10. Should the decision be made to develop an organic IDF capability for inf bns, a more detailed study of organizational structures should be undertaken. That being understood, certain basic principles and best practices can be gleaned from examination of allied doctrine. IDF assets should be assigned at the level where their effective range best matches with the operating zone. For current allied systems, this means that medium mortars support sub-units, and light mortars support sub-sub-units. There are two grouping concepts which could be used for organizing IDF systems: centralized or decentralized. With a centralized organization, systems are grouped above the level they support (e.g. light mortars grouped at sub-unit level), and assigned to lower forces as required. This is the system currently used for artillery. The second organization sees the systems dispersed with the organizations they support (e.g. lone light mortal with each sub-sub-unit).

11. Should the centralized grouping be selected, consideration should be given to organizing the capability in such a way as to allow support to multiple elements. As was seen in examining the artillery, the inability of one battery to support multiple BGs provides a significant limitation. An organization similar to the U.S. Marine Corps mortar platoon should be examined. While the platoon is controlled at battalion level, it is able to operate as two separate squads, thereby providing IDF support to two distinct sub-units.⁸

Emerging Technology

12. At this time, there are no publicly disclosed programs seeking to develop a new form of indirect fire weapon. Therefore, examination of emerging technologies will focus on efforts to

⁸ Department of the Navy, *MCWP 3-11.1, Infantry Company Operations*, Washington, D.C.: Department of the Navy, 2014, 1-10.

improve current mortar fleets in service with allied nations. These efforts have been focused on weight reduction and increased accuracy. The U.S. military is in the process of fielding reduced weight versions of their 60mm and 81mm mortar systems. This program has seen system weights reduced between 14% and 20%.⁹ These savings have been achieved through improved component designs, which require less material, and through the use of composite materials. The second area of development concerns the development of guided mortar rounds, with the goal of increasing lethality and reducing collateral damage. The guidance systems developed are a combination of GPS, laser designation, and infrared sensor.¹⁰ The increased round accuracy has a second order effect of decreasing overall system weight, as fewer rounds are required to achieve a similar impact on the enemy.

CONCLUSION

13. Based on current doctrine and organizations, a capability gap clearly exists in IDF systems to support inf bns. This lack of organic IDF constrains planning and manoeuvre by BG COs and Bde Comds due to the lack of IDF support for manoeuvre elements. The dispersed nature of ADO, and the increased urban nature of future combat, will demand increased firepower, and an IDF capability within the inf bns will uniquely address both issues.

⁹ Matthew Cox, "Army Delivers Lighter 81mm Mortars," Last modified 15 December 2014, <http://kitup.military.com/2014/12/army-delivers-lighter-81mm-mortars.html> ; Global Security, "M224 60mm Lightweight Company Mortar System," Last modified 18 September 2013, <http://www.globalsecurity.org/military/systems/ground/m224.htm>. Weight reduction was 20% (9.3 lbs) for the M224A1 60mm mortar, and 14% (12 lbs) for the M252A11 81mm mortar.

¹⁰ Orbital ATK Armament Systems, "XM395 Precision Mortar Fact Sheet," Accessed 04 February 2016, http://www.orbitalatk.com/defense-systems/armament-systems/xm395/docs/109493_08%20XM395%20PGK%20for%20Mortars%20%28Approved%29.pdf; IMI Systems, "120mm Guided Mortar Munition," Accessed 04 February 2016, <http://www.imi-israel.com/home/doc.aspx?mCatID=68491>; Saab, "Bofors Weapon Systems Strengthens its World Leadership," Last modified 14 September 2000, <http://saabgroup.com/sv/Media/news-press/news/2000-09/Bofors-Weapon-Systems-strengthens-its-world-leadership/>.

14. Accepting the need to develop an IDF capability within inf bns, study will be necessary to determine the correct form and organizational structure of this element. Concurrently, modernization efforts by allied nations and industry should be monitored to stay abreast of developments in system weight reduction and increased round accuracy.

RECOMMENDATION

15. It is recommended that an organic IDF capability be developed for CA inf bns, similar to that which exists within the inf bns of the United States, Britain, and Australia. This capability would increase flexibility in mission planning and execution for Bde Comds and BG COs operating in the non-contiguous battlespace of ADO.

16. It is further recommended that operational research, including allied doctrine reviews, simulation and potentially trials, be conducted to determine the optimum organization within the unit for this capability. At the same time, emerging technologies, including guidance and weight reduction, should be monitored to identify how the inf bn IDF capability might be better delivered.

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