



ASSAULT BRIDGES: A MOBILITY ENABLER ON THE BATTLEFIELD

Major Robin French

JCSP 50

Service Paper

Disclaimer

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

© His Majesty the King in Right of Canada, as represented by the Minister of National Defence, 2024.

PCEMI n° 50

Étude militaire

Avertissement

Les opinions exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

© Sa Majesté le Roi du chef du Canada, représenté par le ministre de la Défense nationale, 2024.

CANADIAN FORCES COLLEGE - COLLÈGE DES FORCES CANADIENNES

JCSP 50 - PCEMI n° 50
2023 - 2024

Service Paper – Étude militaire

ASSAULT BRIDGES: A MOBILITY ENABLER ON THE BATTLEFIELD

Major Robin French

“This paper was written by a candidate attending the Canadian Forces College in fulfilment of one of the requirements of the Course of Studies. The paper is a scholastic document, and thus contains facts and opinions which the author alone considered appropriate and correct for the subject. It does not necessarily reflect the policy or the opinion of any agency, including the Government of Canada and the Canadian Department of National Defence. This paper may not be released, quoted or copied, except with the express permission of the Canadian Department of National Defence.”

« La présente étude a été rédigée par un stagiaire du Collège des Forces canadiennes pour satisfaire à l'une des exigences du cours. L'étude est un document qui se rapporte au cours et contient donc des faits et des opinions que seul l'auteur considère appropriés et convenables au sujet. Elle ne reflète pas nécessairement la politique ou l'opinion d'un organisme quelconque, y compris le gouvernement du Canada et le ministère de la Défense nationale du Canada. Il est défendu de diffuser, de citer ou de reproduire cette étude sans la permission expresse du ministère de la Défense nationale. »

ASSAULT BRIDGES: A MOBILITY ENABLER ON THE BATTLEFIELD

AIM

1. The aim of this paper is to highlight the need to acquire an assault bridging capability for the Canadian Armed Forces (CAF). This paper will demonstrate that assault bridges are necessary to support land operations. This capability remains relevant on the contemporary battlefield, and the paper will provide a possible option to fulfill this requirement.

INTRODUCTION

2. One of the current deficiencies within engineer capabilities in the Canadian Army is the lack of adequate gap crossing. The Directorate of Land Requirements' (DLR) Bridge and Gap Modernization (BGCM) project seeks to resolve many of these deficiencies and is currently in the implementation phase.¹ However, one of the key capabilities that is not included in this project is a replacement for the divested Beaver Leopard 1 Armoured Vehicle Launched Bridge (AVLB), or heavy assault bridge. This paper will demonstrate that this capability is an important aspect of the maintaining mobility of land forces and remains relevant in the modern and future battlefield.

3. This will be demonstrated by detailing the current scope of the BGCM project, why assault bridges are still relevant on the battlefield and then what potential limitations would be imposed on a commander without them. A possible option will be provided to fill this capability gap, the Leguan assault bridge.

DISCUSSION

4. Mobility support is one of the four task categories of combat engineers. It is focused on activities that enable friendly forces to maintain freedom of manoeuvre.² Engineers are responsible to assist friendly forces overcome terrain obstacles during operations, and as such they can reduce the terrain's constraints on the commander's plan.³ This directly supports the Act function in land operations since manoeuvre is an integral aspect of this function. It leverages integral fire and movement to achieve an advantage over the adversary.⁴ Therefore, mobility support directly contributes to manoeuvre. This will remain true for land forces in the future.

¹ Government of Canada, 'Bridge and Gap Crossing Modernization - Defence Capabilities Blueprint', 1 December 2021, <https://apps.forces.gc.ca/en/defence-capabilities-blueprint/project-details.asp?id=1015>.

² Her Majesty the Queen in Right of Canada, 'Engineers in Operations B-GL-361-001-FP-001' (Army Doctrine Centre, 2021), 1-1.

³ Her Majesty the Queen in Right of Canada, 6-1.

⁴ Her Majesty the Queen in Right of Canada, 'ACT The Operational Function - B-GL-320-000/FP-001' (Canadian Army Publishing, 2013), 10.

5. In 2019, the updated capstone operating concept for the Canadian Army, Close Engagement provided an updated vision for how the force should be configured, equipped and trained over the next 10 to 15 years.⁵ Agility is one of the areas discussed. It specifically states that vehicles have a requirement to operate in difficult terrain.⁶ The concept continues to see the need for the Army to be equipped, trained, and organized to be deployable in scalable force packages that include a brigade group in major combat operations.⁷ It continues with the concept of the Empowered Combined Arms Team (ECAT). These sub-unit organizations will be grouped and regrouped to conduct tasks across the spectrum of operations as the situation changes.⁸ Engineers will often be included in this grouping to provide mobility support across difficult terrain. This is not a new concept or expectation. Land forces still require mobility to manoeuvre and achieve effects.

6. With the increasing pace of technological advancements newer domains continue to be leveraged in cyber, space. New technologies like artificial intelligence, and autonomous systems are also being explored within the Pan-Domain Force Employment Concept.⁹ Rightly so, there is a significant focus on developing these capabilities within the pan-domain force to remain relevant. However, this should not be done at the expense of past capabilities that are still required. Strong Secure Engaged, the Canadian Defence policy released in 2017 recognizes the importance of gap crossing capabilities. Bridge and gap crossing capabilities were identified as war-fighting capabilities that will be invested in.¹⁰ The Canadian Army's modernization strategy, Advancing with Purpose affirms the statement that capital investments are required for pan-domain combat enablers that include capabilities that assure freedom of action.¹¹ The strategy includes the BGCM specifically in this section.

7. To understand the project and what it includes, the types of gap crossing and bridging should be first summarized. Military bridging and gap crossing is commonly divided into the following categories.^{12 13}

- a. Assault Bridging. Designed for use by lead echelon forces and rapidly deployed from armoured vehicles so they can be employed under direct threat of the enemy. They require significant cross-country mobility to not

⁵ Canada. Department of National Defence. 'Close Engagement-Land Power in an Age of Uncertainty' (Army Publishing Office, 2019), 8.

⁶ Ibid, 20

⁷ Ibid, 21

⁸ Ibid, 23.

⁹ Canada. Department of National Defence. 'Pan-Domain Force Employment Concept', 2023, 19.

¹⁰ Canada. Department of National Defence. *Strong Secure Engaged: Canada's Defence Policy* (Ottawa, ON, CA: National Defence, 2017), 36.

¹¹ Canada. Department of National Defence. 'Pan-Domain Force Employment Concept', 2023, 19.

¹¹ Canada. Department of National Defence. 'Advancing with Purpose: The Canadian Army Modernization Strategy' (HQ Canadian Army, December 2020), 54.

¹² Fulvio Bianchi, 'Assault Bridges and Bridge-Layers', *Military Technology* 26, no. 3/4 (April 2002): 76.

¹³ Canada. Department of National Defence. 'Gap Crossing B-GL-361-010-FP-001' (Director Army Doctrine, 2004), 4,5.

overly delay the forces they are supporting. Included in this category are fascines which can also be emplaced from Armoured Engineer Vehicles (AEVs), but are only capable of crossing short spans.

- b. Tactical or Support Bridging. Semi-permanent bridging which takes longer to emplace but is able to cross longer spans. It may require dismounted engineers to assemble with the assistance of equipment with less armoured protection.
- c. Line of Communication Bridging. Longer term bridging suitable for sustainment vehicles and civilian traffic. It requires more detailed preparation, heavy equipment, and time to construct.
- d. Floating Bridge or Raft. Capable of spanning longer wet gaps and may be employed in a tactical or logistic role.

8. As mentioned earlier, some of these capabilities are being included in the BGCM project that is being implemented by DLR. This project, which is currently awaiting funding, includes the procurement of line of communication, heavy floating, short support and long support bridges. These systems will be important in replacing our in-service aging equipment. It should be noted that our current systems have very limited to no capability to cross modern armour, recovery vehicles, and vehicle transports.¹⁴ The reader may note that assault bridging is absent on the above list. Although initially included in the project, assault bridges were removed from the scope due to affordability concerns.¹⁵ It is reassuring that a critical project continues to progress but it does not solve a key deficiency, the ability for the CAF to conduct assault crossings.

9. It is worth discussing what capabilities the CAF will be lacking without assault bridges to understand why they are required. First, the width of gaps that can be bridged by modern assault bridging will be discussed. Modern AVLBs can launch bridges up to 27m in length, meaning that they can span gaps up to 24m, depending on the embankments.¹⁶ In some cases, a tandem lay technique can be used to place one bridge overlapping upon the first to extend the crossing width. This should however be avoided as it is likely to damage the bridges beyond repair.¹⁷ As such, this paper will only consider the maximum crossing width of 24m. What is the statistic significance of this width?

10. Studies have shown that in general 60% of gaps are under 6m in width.¹⁸ The CAF currently can conduct assault crossings to some degree using fascines emplaced with the AEV of this width. However, another 20% of gaps fall within the 6 to 20m width

¹⁴ DLR, 'Bridge and Gap Crossing Modernization Info Brief', 4.

¹⁵ DLR, 4.

¹⁶ Bianchi, 'Assault Bridges and Bridge-Layers', 76.

¹⁷ Canada. Department of National Defence. 'Gap Crossing B-GL-361-010-FP-001', 19.

¹⁸ Bianchi, 'Assault Bridges and Bridge-Layers', 84.

range.¹⁹ Without assault bridges, this is the range in which we will be deficient in our assault crossing capability. If the CAF lacks assault bridging, a deliberate crossing using alternate tactical, support, or float bridging will be required.

11. There is a significant difference between hasty assault crossings and deliberate crossing operations. Assault crossing capabilities (AVLBs or fascines) are generally the only option for use when conducting a hasty crossing if an intact crossing is not available. Hasty crossings are referred to in the Gap Crossing Engineer Field Manual as a crossing that takes place with resources internal to the attacking force.²⁰

12. When a hasty crossing is not possible, a deliberate crossing operation is required. This could be due to enemy strength, when an initial attempt has failed or due to the complexity of the obstacle.²¹ If integral resources are not available to the leading echelons in the form of assault bridges, it would mean that approximately 20% of gaps would by default become a deliberate crossing. The main impacts of this would be two-fold, in time and resources required. There would be additional time required to conduct reconnaissance, planning, coordination, and to bring forward engineer bridging equipment.²² Note that the alternate equipment required would one of the options being acquired by the BGCM that take longer to build, relies on less protected equipment, and dismounted engineers to construct. The complexity and resources required to accomplish a deliberate wet gap crossing can be immense compared to that of a hasty crossing.

13. In some cases, a hasty crossing over a gap under 20m with assault bridges could be completed with a force as small as a combat team with adequate fire support. The drill is no different then breaching another obstacle in proximity to an enemy. However, if an opposed deliberate crossing is required, the minimum force size grows significantly to a brigade. This is largely since the construction of bridges needs to be done in an area out of direct fire and observation of the enemy to be successful, so a bridgehead force of significant size is required to provide a protective perimeter around the crossing sites. The time and resources required to cross a 20m gap expands exponentially without having an assault bridge, severely limiting the options of the commander and what they can accomplish.

14. In 2016, the DRDC Centre for Operational Research and Analysis (CORA) conducted a study on the options for the BGCM. This vignette, task, requirement, and option (VITRO) study used a variety of vignettes to find the optimally suited systems in each vignette.²³ In both of the warfighting high-threat vignettes, the heavy assault bridge was found to be one of the optimally suited systems.²⁴ It was not a preferred option in the

¹⁹ Bianchi, 84.

²⁰ Canada. Department of National Defence. 'Gap Crossing B-GL-361-010-FP-001', 2.

²¹ Ibid, 3.

²² Ibid, 4.

²³ Steve Bassindale and Emile Pelletier, 'Bridge and Gap Crossing Modernization Project', Scientific Report (Defence Research and Development - Centre for Operational Research and Analysis, March 2016), i.

²⁴ Ibid, 23.

other three vignettes that included peace support and domestic scenarios since these included the requirement to traffic civilian vehicles, which is a limitation of the assault bridge. This does not detract from its utility in fulfilling a critical niche of conducting rapid crossings in high-threat environments.

15. Currently, Canada and its allies in Latvia have limited to no assault gap crossing capability. This is an area where Canada could contribute and provide key mobility support to complement the armoured squadron that has already been sent to the enhanced Forward Presence force in Latvia. Even more so as the Battle Group transitions to a Brigade in a strategy shift from forward presence to forward defense.²⁵ It might be questioned why an assault crossing capability would be important for NATO forces in Europe with a defensive purpose. Mobility is still a critical aspect in defensive and delay operations. These rapidly placed and removed assault bridges could be in high demand to assist with the withdrawal of a covering force or employed to enable a counterattack.²⁶ Without this option a commander would be limited in their options of manoeuvre, hindering their abilities to disrupt or strike the enemy.

16. Some may still be sceptical and question the requirement for the Canadian Army to be a heavy force that includes armour. It should be noted that assault bridges are not implicitly tied to heavy armoured platforms like the Leopard and Abrams. If the way forward for the Canadian Army is a medium force based on a LAV like platform, the same mobility challenge will persist when encountering gaps on the battlefield. Assault bridges have been developed for wheeled armoured vehicles such as the Stryker and Boxer.^{27 28} A system like this would maintain an assault crossing capability for a medium force. However, these systems do not offer the same load capacity as those on launched from tracked vehicles. The impact of this is that the bridging would not allow multinational partners' armour to cross when conducting multinational operations which should be the expectation for Canada, particularly in the NATO context.

17. Several of Canada's NATO allies continue to see a value in assault bridges for their land forces. For example, the United States has started replacing their previous generation assault bridges with the new Joint Assault Bridge.²⁹ It is not only Canada's larger allies that see a need to continue to modernize and maintain this capability. Norway has recently taken delivery of Leopard 2 mounted Leguan AVLBs.³⁰ Finland in

²⁵ Marta Kepe, 'From Forward Presence to Forward Defense: NATO's Defense of the Baltics', 14 February 2024, <https://www.rand.org/pubs/commentary/2024/02/from-forward-presence-to-forward-defense-natos-defense.html>.

²⁶ Her Majesty the Queen in Right of Canada, 'Engineers in Operations B-GL-361-001-FP-001', 5-5.

²⁷ Pearson Engineering, 'Bridging the Gap for Stryker', Pearson Engineering, accessed 15 February 2024, <https://www.pearson-eng.com/news/bridging-the-gap-for-stryker/>.

²⁸ Posted by Brian Hartigan, 'Boxer-Based Bridge Layer Unveiled', *CONTACT Magazine* (blog), 10 September 2021, <https://www.contactairlandandsea.com/2021/09/10/boxer-based-bridge-layer-unveiled/>.

²⁹ 'Our Agility Is Bridging an Army Modernization Gap', Leonardo DRS, accessed 18 February 2024, <https://www.leonardodrs.com/news/feature-stories/our-agility-is-bridging-an-army-modernization-gap/>.

³⁰ Peter Felstead, 'Norwegian Army Takes Delivery of Leopard 2-Based Leguan AVLBs - European Security & Defence', 11 December 2023, <https://euro-sd.com/2023/12/major-news/35555/norwegian-leopard-2-avlbs/>.

December 2023, also ordered additional Leopard 2 AVLBs to augment the AVLBs that they took delivery of over the 2005-2008 and 2018-2022 periods.³¹ This confirms that AVLBs are still relevant and a requirement for nations that want to be prepared to field an agile and mobile force in modern high intensity conflict.

18. The Leguan assault bridge is a fielded assault bridge that is built for the Leopard 2 chassis. This is the obvious option for the Canadian Army if it continues to maintain armoured units based on the Leopard 2 as it will maintain a common fleet for both mobility and maintenance purposes. Notably, the Leguan bridge has also been fitted and launched from wheeled vehicles similar to what may replace the heavy logistic wheeled vehicle fleet.³² Having a wheeled vehicle with the ability to launch and recover the bridges would provide additional versatility to bring additional bridges forward to the armoured lead echelon and also recover the assault bridges in the rear when they are no longer required.

CONCLUSION

19. An assault crossing capability is required for the Canadian Army to be a credible mobile force on a modern battlefield fighting near-peer and above adversaries. It fills a distinct and necessary role of getting lead echelons across 60% of the gaps they encounter during manoeuvres. Without it, engineers will not be able to provide rapid and agile mobility support, limiting a commander's options on the battlefield. This will create delays and tie up the forces required to conduct a deliberate crossing which otherwise could have been hasty. Our NATO allies continue to see a need for this capability, as demonstrated by their actions replacing older AVLB platforms, something Canada has not yet undertaken.

20. Although other new capabilities must be integrated into pan-domain force, with respect to crossing obstacles, the assault bridge remains integral to getting across many gaps that land forces will encounter on the battlefield.

RECOMMENDATION

21. The CAF should actively seek funding for Leopard 2 based AVLBs like the Leguan. This platform should be reintegrated into armoured engineer troops and be considered for deployment to the brigade in Latvia.

³¹ Peter Felstead, 'Finland Orders Leguan Armoured Vehicle-Launched Bridges from Patria - European Security & Defence', 19 December 2023, <https://euro-sd.com/2023/12/major-news/35683/dfd-orders-avlbs-from-patria/>.

³² Bianchi, 'Assault Bridges and Bridge-Layers', 77.

BIBLIOGRAPHY

- Bassindale, Steve, and Emile Pelletier. 'Bridge and Gap Crossing Modernization Project'. Scientific Report. Defence Research and Development - Centre for Operational Research and Analysis, March 2016.
- Bianchi, Fulvio. 'Assault Bridges and Bridge-Layers'. *Military Technology* 26, no. 3/4 (April 2002): 76–84.
- DLR. 'Bridge and Gap Crossing Modernization Info Brief'. April 2023.
- Felstead, Peter. 'Finland Orders Leguan Armoured Vehicle-Launched Bridges from Patria - European Security & Defence', 19 December 2023. <https://euro-sd.com/2023/12/major-news/35683/dfd-orders-avlbs-from-patria/>.
- Felstead, Peter. 'Norwegian Army Takes Delivery of Leopard 2-Based Leguan AVLBs - European Security & Defence', 11 December 2023. <https://euro-sd.com/2023/12/major-news/35555/norwegian-leopard-2-avlbs/>.
- Canada. Department of National Defence. 'Bridge and Gap Crossing Modernization - Defence Capabilities Blueprint', 1 December 2021. <https://apps.forces.gc.ca/en/defence-capabilities-blueprint/project-details.asp?id=1015>.
- Hartigan, Posted by Brian. 'Boxer-Based Bridge Layer Unveiled'. *CONTACT Magazine* (blog), 10 September 2021. <https://www.contactairlandandsea.com/2021/09/10/boxer-based-bridge-layer-unveiled/>.
- Canada. Department of National Defence. 'ACT The Operational Function - B-GL-320-000/FP-001'. Canadian Army Publishing, 2013.
- Canada. Department of National Defence. 'Advancing with Purpose: The Canadian Army Modernization Strategy'. HQ Canadian Army, December 2020.
- Canada. Department of National Defence. 'Close Engagement-Land Power in an Age of Uncertainty'. Army Publishing Office, 2019.
- Canada. Department of National Defence. 'Engineers in Operations B-GL-361-001-FP-001'. Army Doctrine Centre, 2021.
- Canada. Department of National Defence. 'Gap Crossing B-GL-361-010-FP-001'. Director Army Doctrine, 2004.

Canada. Department of National Defence.. *Strong Secure Engaged: Canada's Defence Policy*. Ottawa, ON, CA: National Defence, 2017.

Canada. Department of National Defence. 'Pan-Domain Force Employment Concept', 2023.

Kepe, Marta. 'From Forward Presence to Forward Defense: NATO's Defense of the Baltics', 14 February 2024.
<https://www.rand.org/pubs/commentary/2024/02/from-forward-presence-to-forward-defense-natos-defense.html>.

Leonardo DRS. 'Our Agility Is Bridging an Army Modernization Gap'. Accessed 18 February 2024. <https://www.leonardodrs.com/news/feature-stories/our-agility-is-bridging-an-army-modernization-gap/>.

Pearson Engineering. 'Bridging the Gap for Stryker'. Pearson Engineering. Accessed 15 February 2024. <https://www.pearson-eng.com/news/bridging-the-gap-for-stryker/>.