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## The Missing Link: Addressing the Gap Between the Fighting Echelon and Combat Service Support

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# **THE MISSING LINK: ADDRESSING THE GAP BETWEEN THE FIGHTING ECHELON AND COMBAT SERVICE SUPPORT**

## **AIM**

1. Within the contemporary operating environment, the proliferation of information surveillance and reconnaissance capabilities has made it extremely difficult for conventional forces to avoid detection, particularly while conducting manoeuvre. For the Australian Army, the issue of avoiding detection and achieving operational surprise for its mechanised combat forces has been exacerbated by a new fleet of combat service support (CSS) vehicles which are of increased size and mass compared to the previous fleet. The increase in vehicle size has reduced the mobility of the CSS fleet, placing a significant restraint on the freedom of manoeuvre and survivability of both CSS and combat forces. As such, this service paper will examine a CSS vehicle capability gap that exists within the Australian Army and how it can be addressed.

## **INTRODUCTION**

2. Heinz Guderian, a German general and tank expert from World War Two, is famously quoted as saying "*Logistics is the ball and chain of armoured warfare.*"<sup>1</sup> This statement implies that logistics, which refers to the art of moving, quartering, and supplying troops, is an essential but burdensome aspect of armoured warfare. According to Guderian, logistics constrains the mobility and effectiveness of armoured units, slowing them down and limiting their ability to engage in offensive operations. Guderian's statement can be understood in the context of his contributions to the development of armoured warfare and the blitzkrieg tactics that were used by Germany in World War II. As one of the principal architects of these tactics, Guderian understood the importance of mobility and speed in achieving battlefield success. However, he also recognized that logistics played a critical role in sustaining and supporting armoured units and that neglecting logistics could have dire consequences. Thus, while logistics was often seen as a hindrance to armoured warfare, Guderian understood that it was a necessary evil which had to be managed effectively in order to achieve victory on the battlefield. Guderian's perspective on logistics is well found given the delays and risk that were imposed onto his force by an inability of the supply chain to maintain pace with his advances.<sup>2</sup> Although it can be argued that Guderian demonstrated poor command by not accepting and managing the mobility limitations imposed by logistics vehicles, it does not diminish the need to equip a force adequately to enable a competitive edge.

3. To enable successful provisioning of mechanised forces and reduce the "ball and chain" effect as described by Guderian, a system of logistics echelons was designed. The echelon system is broken down as such: the Fighting Echelon (F Ech), A1 Echelon (A1 Ech), A2 Echelon (A2 Ech) and B Echelon (B Ech). Each echelon plays a vital yet different role. The use and composition of echelons is task dependent and strongly influenced by the tactical scenario to

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<sup>1</sup>Harold Coyle, *Sword Point* (Gallery Books, 1988). 141.

<sup>2</sup>Andrew Roberts, *The storm of war: A new history of the Second World War* (Penguin UK, 2009). 18.

determine size, strength and location. For the purpose of this paper, the focus will be placed onto the A1 Ech which is organic to a company sized element and typically consists of approximately five vehicles being a maintenance vehicle, recovery vehicle, two supply vehicles and an ambulance. The A1 Ech operates directly with or close to the F Ech, affording fighting forces direct battle replenishment and support. For the A1 Ech to deliver its CSS effect to the F Ech, its vehicles must have the following characteristics: commensurate mobility, survivability and self-protection firepower. An A1 Ech possessing these attributes can manoeuvre with the F Ech building opportunity for the combat force to project sustained advances along unexpected avenues of approach. Despite a critical need for A1 Ech vehicles to have the described attributes the Australian Army has excluded purchase of a supply variant to support its new fleet of IFVs under Land 400 Phase 3.<sup>3</sup> This service paper will review the CSS vehicle capability gap by firstly exploring historical examples, highlighting why logistic vehicle mobility is critical. It will then examine the Australian Army's current medium rigid truck which has been selected to fill the A1 Ech supply role, followed by an examination of the challenges associated by using it. Finally, a means by which the CSS capability gap can be closed will be proposed.

## DISCUSSION

4. The role of CSS elements in first line units is to deliver sustainment and maintenance effects in order to enable command and control, manoeuvre and combat power to achieve mission success for combat forces. As the armies of the late 18th Century to 19th Century expanded to a size that could not be sustained by living off the land they occupied, a system of baggage trains formed by horse and wagon were developed, which has been defined as the Etappen system.<sup>4</sup> However, the advent of mechanisation in the 20th Century quickly outran the pace of horses and wagons demanding an evolution to sustaining mechanised combat forces. Trucks initially met the stop gap to organically support mechanised forces. However, their limitations were widely recognised which saw the use of halftracks and fully tracked vehicles to engender extra mobility and survivability.<sup>5</sup> Stepping forward into the 21st Century, trucks remain a critical component of military supply chains. Further advancements in vehicle technology and freight handling systems have meant that trucks are more capable than ever in rapidly moving vast quantities of military materiel across extended distance.

5. A particularly crucial advancement in freight handling, which dramatically expanded the efficiency of military resupply in the field, is containerization. Prior to containerization, bulk supplies were typically transported in individual boxes or packages, making resupply efforts more complicated and time-consuming. Containerization has allowed for supplies to be packed

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<sup>3</sup>Julian Kerr, "The Land 400 Phase 3 RMA path," *Australian Defence Magazine*, 2021; "Rheinmetall submits bid for Australian Army LAND 400 Phase 3 project," *Army Technology*, 2019, <https://www.army-technology.com/news/rheinmetall-australia-land-400-phase-3/>; Albert Palazzo, *Deciding the future: the Australian Army and the infantry fighting vehicle*, Australian Strategic Policy institute (2022), <https://www.aspi.org.au/report/deciding-future>.

<sup>4</sup>Javier Ponce Marrero, "Logistics for commerce war in the Atlantic during the First World War: The German Etappe system in action," *The Mariner's Mirror* 92, no. 4 (2006).

<sup>5</sup>W Blair Haworth, *The Bradley and How It Got That Way: Technology, Institutions, and the Problem of Mechanized Infantry in the United States Army* (Greenwood Publishing Group, 1999). 23.

into standardized intermodal containers that can be easily transported by multiple modes of transportation and can be quickly offloaded and moved to the front lines. Containerization has also led to significant savings in military logistics, allowing for more efficient use of transportation assets, reducing the amount of handling required to move supplies.<sup>6</sup> The Australian Defence Force (ADF) has not been left behind in incorporating containerization into its trucking fleets. Under the Land 121 Project in the Phase 3b tranche, the Australian Army introduced a new fleet of medium (40M) and heavy rigid (HX77) trucks. The project involved an acquisition of 2,707 medium and heavy trucks, 3,858 modules, and 1,753 trailers. The Land 121 Phase 3B trucks were designed to support a logistics system based on containerization which included specialised modules for supply classes one (bulk water) and three (bulk fuel).<sup>7</sup> The Land 121 truck fleet has been touted as being designed to operate in a wide range of environments, from deserts to forests and mountains, based off a strong power plant and advanced suspension systems. The manufacturer, Rheinmetall, sold them as being highly capable of navigating difficult terrain and rough roads with ease.

6. Containerization has been a critical advancement for creating logistics system that can sustain large military organisations. However, it has generated a need to increase the overall dimensions and mass of modern military trucks. To incorporate containerisation a truck needs to have a tray length of between 20ft or 40ft, being the standard container sizes. The resulting increase in vehicle size to support containers is displayed in Figure 1.1 which shows the old version of the Canadian Armed Forces medium truck in front of their new medium support vehicle system which can handle a 20ft container. A similar situation exists between the Australian Army's previous medium truck in the Mercedes-Benz Unimog which has a length of 6,940mm, width of 2,490mm and height of 3,140mm compared to the new Rheinmetall 40M at a length of 8,232mm and width of 2,556mm and height of 4,064mm.<sup>8</sup> Even more differentiating between the vehicles is the contrast between front axle weights with the Unimog's at 4,600 kgs and the 40M's at 9,000kg. With the 40M's front axle exerting approximately twice the ground pressure this significantly increase the gap between what terrain the trucks are able to traverse, particularly in wet environments.<sup>9</sup> The stark increase in size holds a broad range of impacts for operating the vehicle in close support to an F Ech, such as limiting ability to navigate through close terrain and vegetation. Given the height and mass increase of the 40M, its overall centre of gravity is also higher than that of the Unimog, further inhibiting the potential for cross-country use. Additionally, the turning circle of the 40M is 18,900mm while the Unimog was

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<sup>6</sup>Matthew Hansen, "Containerisation of the Canadian Army Echelon: A Need for Updated Doctrine" (Canadian Forces College, 2021), <https://www.cfc.forces.gc.ca/259/290/23/192/Hansen.pdf>.

<sup>7</sup>"Overlander - Medium Heavy Capability, Field Vehicles, Modules and Trailers," Department of Defence, 2019, 2023, <https://www.defence.gov.au/project/overlander-medium-heavy-capability-field-vehicles-modules-and-trailers>.

<sup>8</sup>Mercedes Benz, Electrical and Mechanical Engineering Instructions: Truck, Cargo, Medium, MC2, 4x4, Mercedes Benz U1750L, (2003).; Robert Dabrowski, Technical Manual User Handbook: Truck, Cargo, Mediumweight, (Commercial and General Service Vehicles Systems Program Office, 2014).

<sup>9</sup>John Matsumura, Corporation Rand, and Division Rand Corporation. National Security Research, *Assessing tracked and wheeled vehicles for Australian mounted close combat operations: lessons learned in recent conflicts, impact of advanced technologies, and system-level implications*, vol. RR-1834-AUS (Santa Monica, Calif: Rand Corporation, 2017).

16,800mm.<sup>10</sup> The combination of all these factors means that, despite the 40M having more power and a better suspension system, it lacks cross-country mobility and its ability to operate as part of a legitimate A1 Ech for mechanised forces is restricted. Opposingly, the cross-country mobility of mechanised combat forces has continued to be enhanced through advancements in fire control systems, suspension, hydraulics and composite armour materials. Seemingly, logistics vehicles have diverged in their development pathway, seeking efficiency where combat vehicles have been built for effectiveness.



Figure 1.1 – CAF medium rigid vehicle then and now, old truck in front of the new.<sup>11</sup>

7. The Australian Army has utilised mechanised forces since its inclusion of the Bren Gun Carrier in World War Two. Since this time, armoured vehicles have advanced significantly in their mobility and firepower.<sup>12</sup> The Australian Army currently fields two tracked armoured combat vehicles being the M1A1 main battle tank and the M113AS4 armoured personnel carrier. To provision organic supply to these armoured vehicles, the M113AS4 Armoured Logistics Vehicle (ALV) is utilised.<sup>13</sup> The ALV, as a tracked and armoured logistics platform, is well positioned to function as a CSS supply vehicle within the A1 Ech, providing the linkage between the highly mobile F Ech and more ponderous wheeled logistics trucks of the A2 Ech. However, the Australian Army is in the process of modernising its mechanised forces to field an Infantry

<sup>10</sup>Benz, Short Electrical and Mechanical Engineering Instructions: Truck, Cargo, Medium, MC2, 4x4, Mercedes Benz U1750L; Dabrowski, Short Technical Manual User Handbook: Truck, Cargo, Mediumweight.

<sup>11</sup>Hansen, "Containerisation of the Canadian Army Echelon: A Need for Updated Doctrine."

<sup>12</sup>R.M Ogorkiewiez, "The Future of the Battle Tank," *Army Journal*, no. 269 (1971), [https://researchcentre.army.gov.au/sites/default/files/aaj\\_269\\_oct\\_1971.pdf](https://researchcentre.army.gov.au/sites/default/files/aaj_269_oct_1971.pdf).

<sup>13</sup>"M113AS4 Armoured Personnel Carrier," Australian Army, 27 Feb 2023, <https://www.army.gov.au/our-work/equipment-uniforms/equipment/vehicles/m113as4-armoured-personnel-carrier>.

Fighting Vehicle (IFV) under the Land 400 Project Phase 3, which will see the retirement of the M113AS4 fleet, including the withdrawal from service of the ALV.<sup>14</sup> With the removal of the ALV, the Australian Army will retire its only tracked armoured supply vehicle which is not scoped for a like for like replacement. The current plan to provide organic supply to the new IFV through the A1 Ech is to utilise the 40M.

8. If the Australian Army incorporates the 40M into its mechanised A1 Ech, it will severely hinder the versatility of this CSS organisation and limit the operational manoeuvrability of armoured forces. This statement is reflected in the Russian Army's experience in the Ukraine War where they have struggled to achieve any measure of operational tempo with their armoured forces.<sup>15</sup> In multiple instances, Russian armoured forces have received significant armoured losses while trying to undertake resupply from a logistics chain that has limited ground mobility.<sup>16</sup> The Russian military has built its army up to be centred around railways using them to project supplies, vehicles and personnel forward into the battlespace where fleets of trucks ferry supplies along formed roads to combat units. However, Russian railway gauge does not match Ukraine's, which has constrained the ability for the Russian Army to project logistics.<sup>17</sup> Subsequently, Russia has been forced to use wheeled trucks across extended ground lines of communication and form supply dumps along main supply routes which combat forces must return if they are to be resupplied. As Russia is constrained to using highways for logistics, Ukrainian forces can predict the movement of Russian combat and logistics elements to destroy them by deliberate ambushing and targeting. By limiting the ability to undertake cross country resupply of combat forces, Russia has undercut the potential of achieving operational surprise and exposed its forces to predictable patterns.<sup>18</sup> The constraints placed on Russian military are now slowly being built into the logistics system of the Australian Army. Although the ADF does not use rail as a primary mode of logistics distribution, large containerised trucks are imposing similar mobility limitations. Once the ALV is withdrawn from service, a missing link will be created in the Australian Army's ability to provision CSS to the F Ech.

## CONCLUSION

9. Since Army's have grown in size beyond the ability to sustain themselves off the land, a system of logistics echelons has been required to sustain the force. With the advent of

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<sup>14</sup>"ANZACs under armour: the future Australian IFV," The Strategist, Australian Strategic Policy Institute, 2015, 2023, <https://www.aspistrategist.org.au/anzacs-under-armour-the-future-australian-ifv/>.

<sup>15</sup>Robert Dalsjö, Michael Jonsson, and Johan Norberg, "A Brutal Examination: Russian Military Capability in Light of the Ukraine War," *Survival (London)* 64, no. 3 (2022), <https://doi.org/10.1080/00396338.2022.2078044>. 10-11

<sup>16</sup>Peter Skoglund, Tore Listou, and Thomas Ekstrom, "Russian Logistics in the Ukrainian War: Can Operational Failures be Attributed to logistics?," *Scandinavian Journal of Military Studies* 5, no. 1 (2022), <https://sjms.nu/articles/10.31374/sjms.158>.; David D. Sussman, "From "Resource Wars" to "Resources in Wars";" *The Fletcher forum of world affairs* 46, no. 2 (2022).; M Hugos, "Russian Logistics for the Invasion of Ukraine," *SCM Globe* (2022), <https://www.scmglobe.com/russian-logistics-for-the-invasion-of-ukraine/>.

<sup>17</sup>Michael Kofman et al., *Russian Military Strategy: Core Tenets and Operational Concepts*, CNA (Russian strategic Initiative U.S European Command, 2021).

<sup>18</sup>Lukas Milevski, "Russian Logistics and Forward Urban Defense in the Baltic States," 102, no. 6 (2022); Kofman et al., *Russian Military Strategy: Core Tenets and Operational Concepts*.

mechanisation combat forces are able to travel at high speeds across difficult terrain. However, mechanised forces require significant quantities of stores and supplies to be able to function which inhibits them from undertaking operations without the necessary logistics support networks in place. The need to shift vast quantities of stores to support massed mechanised combat forces has shaped logistics vehicles into platforms that are highly efficient at carrying bulk quantities of stores through containerisation. However, the designing of logistics vehicles to be highly efficient has removed an aspect of effectiveness by reducing their tactical mobility. As the Australian Army retires its fleet of M113AS4 Armoured Personnel Carriers it will lose its only tactical A1 Ech supply vehicle which is not scoped for replacement under Land 400 Phase 3. To say that the 40M will replace the ALV is setting the Army up for failure due to the limited cross-country ability of the truck.

## RECOMMENDATION

10. To address the CSS capability gap identified in this paper, several options exist. The first of these could involve broadening the scope of the Land 400 Phase 3 variants to include a supply version. However, it is acknowledged that the Australian Government has placed a cap of 450 vehicles that may be purchased through the project, which would therefore reduce the number of combat vehicles that could be acquired.<sup>19</sup> Modifying an IFV combat variant to a supply variant also creates a highly expensive logistics vehicle to deliver an effect that can be achieved by cheaper means. With consideration to minimising expenditure and avoiding circumstances experienced by Russian forces, the selection of a much smaller truck should be explored for linking the containerised system to the F Ech. Instituting a light to medium truck of approximate size to a Unimog with a 6x6 wheel configuration offers a substantially more versatile platform. Studies directed by the Australian Defence Science and Technology Group have demonstrated that, with a 6x6 wheel arrangement, an opportunity exists to fit a modern track over wheels system which can significantly enhance wheeled vehicle mobility.<sup>20</sup> On a 6x6 truck, a track over wheel configuration is reminiscent of the halftracks from World War 2 which allowed logistics vehicles to keep pace with armoured forces, yet at a much-reduced cost. Track over wheel systems take approximately an hour to fit and can reduce the subsequent vehicle ground pressures by 50 – 100 percent. Trucks using this system also have the option to remove the track and undertake long journeys using just their wheels, thereby enabling higher speed journeys. Track over wheel arrangements are yet to be tested properly for military use but show excellent capability within the forestry industry therefore further testing on the design is warranted.<sup>21</sup> Regardless of what solution is ultimately found, the Australian Army must first recognise that the current plan to utilise the 40M as part of an armoured A1 Ech will significantly hinder the operational capacity of tracked forces. Incorporating a truck design for

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<sup>19</sup>Brett Worthington, "Multi-billion-dollar army vehicle project faces cutbacks as problems emerge on related program," *Australian Broadcasting Company*, 2022, <https://www.abc.net.au/news/2022-04-06/multi-billion-dollar-army-vehicle-project-facing-cutbacks/100968910>; Palazzo, *Deciding the future: the Australian Army and the infantry fighting vehicle*; Chris McKendry, LAND 400 Phase 2: Mounted Combat Reconnaissance Capability, (Capability Acquisitions and Sustainment Group, 2019). 2.

<sup>20</sup>Matsumura, Rand, and Rand Corporation. National Security Research, *Assessing tracked and wheeled vehicles for Australian mounted close combat operations: lessons learned in recent conflicts, impact of advanced technologies, and system-level implications*, RR-1834-AUS. 115-125.

<sup>21</sup>*Ibid*, 116.



containerized operations into a high mobility force will only move to constrain freedom of manoeuvre and incur avoidable risks.

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