Australian Army
Research Centre

Strategic Assessment

Quarter 1, 2023

Serving the Nation

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Executive Summary

This assessment provides insights into the global supply chain issues that will shape Defence's ability to maintain adequate war stocks of strike weapons. It discusses the impact of the Russian invasion of Ukraine on Western stockpiles, the diversification of rare earth processing and the increasing pressure on Western militaries to secure their stockpiles of strike weapons. These topics have been emphasised on the basis of their significance to long-term strategic decision making, the formation of narratives, and their potential influence on capability development and the future force outlined in the 2023 Defence Strategic Review (DSR).

Introduction

Much has changed since the Australian Army Research Centre's last Strategic Assessment in Quarter 3, 2021. The Covid-19 pandemic has become a part of everyday life, but its impact is still being felt across the social, economic and industrial spectrum. Russia's invasion of Ukraine in February 2022 has absorbed significant resources from the West and continues to dominate global attention. Supply chains remain stretched and the contribution of Western equipment to Ukraine has depleted Western-derived war stocks. Severe weather events, including cyclones and floods, are occurring more often and are more severe than ever before. The clouds of recession hang over many countries, as they struggle to manage pressures due to high levels of public debt incurred during the pandemic.

This assessment will review some enduring trends from 2022 into 2023. It considers the ongoing challenge of electrification and rare earths and the effect they will continue to have on global supply chains. These factors will inform challenges in global supply chain production and delivery that will impact Defence's ability to acquire and maintain adequate war stocks of strike weapons. It also discusses the impact of the Russian invasion of Ukraine on Western stockpiles, the diversification of rare earth processing and the increasing pressure on Western militaries to secure stockpiles of strike weapons.

Russian Invasion of Ukraine

Quarter 1 2023 marks a year since the Russian invasion of Ukraine, on 24 January 2022. Despite initial momentum in early 2022, Russian forces were swiftly bogged down and even rolled back in some regions, hampered by ineffective supply lines. Between July and November 2022, Ukrainian armed forces went on the counter offensive in the Kherson region in the southeast, and from late-August 2022, in the Kharkiv region in the northeast. These assaults successfully demonstrated Ukraine's ability to mount combined-arms operations and resolve to retake ground lost in the initial Russian invasion. How the war will evolve over the coming months and years remains the subject of considerable debate. Many commentators expect a large spring or summer offensive from Ukraine in the coming weeks and months using heavy equipment from partners, including donated Leopard and Abrams tanks. Such an offensive is likely intended to demonstrate to Western backers Ukraine's capacity to retake ground, in order to justify sustained Western military support. Ukraine's ability to continue demonstrating such progress and to articulate a viable theory of victory will be vital in avoiding a narrative that the war has bogged down and that only a negotiated settlement will end the conflict. This is not in Ukraine's interest, or the West's for that matter, as it would almost certainly require Ukraine to cede territory and buy time for Russia to commence rebuilding its severely degraded military, thus allowing Putin to claim victory. However, while no one definitively knows how the war will play out, most observers agree that the conflict will not end in the coming months, and more than likely, will continue to evolve over several years.

The heavy reliance on standoff weapons on both sides has required sustained use of missiles and other strike weapons, with a particular influence on Russia due to the effect of sanctions on its ability to source materials for parts. In a Defense forum in December 2022, the US Director of National Intelligence, Avril Haines, confirmed that Russia was using its stockpiles faster than it could resupply. However, it is unclear how large current Russian stocks are for various munitions and how much longer they will be able to sustain themselves at a reduced rate. It is likely Russia will lean more on its allies for support as the war continues. While unnamed US officials have said China is providing nonlethal aid to Russia and maybe considering sending lethal aid, the flow of materials to Russia, whether officially sanctioned or not, are helping Russia to sustain its military effort. This demonstrates that while sanctions have helped blunt Russia's efforts, it is far from incapacitated. The ongoing provision of aid, in combination with Putin's political aspirations, could enable Russia to drag the war out for much longer.

Before the war began, Ukraine's military stockpiles were significantly smaller than Russia's and it has relied heavily on support from the West in the form of military equipment and munitions to sustain its operations. The use of land-based strike systems, epitomised in Ukraine by the High Mobility Artillery Rocket System (HIMARS), has been a core part of Ukraine's operational successes. This has been clearly demonstrated by successful employment of these systems to disrupt Russian supply lines. Ukraine will continue to rely on Western support to sustain its military operations and maintain pressure on Russian reinforcement efforts.

Despite reports that China is considering stepping up its support to Russia, it has so far been fairly restrained in its response to the war in Ukraine. Although Beijing has refused to name Russia as the aggressor and instead blames the US and the expansion of NATO, in February 2023, the Chinese Communist Party (CCP) outlined its 12-point peace plan to end hostilities in Ukraine. While China claims to be neutral, the plan clearly advantages Russia. This is unsurprising noting the long history between the two countries and recent high-level meetings between senior diplomats. Increases in Chinese involvement would likely necessitate a further increase in support from the West for Ukraine, especially if the CCP was to supply lethal aid to Russia, which would enable it to continue waging war in Ukraine. Discussions between President Xi Jinping and President

Volodymyr Zelenskyy by phone in April 2023 led to speculation that China might assist in finding a settlement acceptable to both sides. However, as long as China's peace plan does not recognise Russia as the aggressor or involve Russia withdrawing troops from occupied areas, it will remain unacceptable to Zelenskyy. Further, unless Ukraine loses support from the West, Zelenskyy is unlikely to accept any proposal that involves ceding any territory, including the areas annexed in Russia's 2014 invasion and occupation of Crimea.

Key Takeaways

- Ukraine is heavily reliant on Western countries to continue the supply of weapons required to sustain the war. This is likely to continue for the foreseeable future with an end to the war not expected in the next few years.
- China may begin supply weapons to Russia through either official or unofficial channels, in which case, Western support may also need to increase.
- The supply of weapons to Ukraine has already reduced global war stocks and supply is struggling to keep up with existing demand.

Australian Army soldiers deployed on Operation Kudu provide weapon training to recruits from the Armed Forces of Ukraine in the United Kingdom.

Increasing Stockpiles

The provision of strike weapons to Ukraine comes as Western militaries are modernising and bolstering their own war stocks, both in response to Russia's aggression but also to posture their military capability to deter Chinese adventurism.

The recent DSR highlights the need for Australia to build its capacity to achieve 'impactful projection', including the need for Army to accelerate the acquisition of land and maritime based strike capabilities. It also outlines the requirement for Australia to urgently develop its own guided weapons and explosive ordnance production capacity to develop and accelerate sovereign capability. This is a recognition that the ADF cannot rely on overseas production lines or supply chains to guarantee the availability of these key elements of military preparedness.

However, Australia is not alone in seeking to bolster military preparedness, particularly through the acquisition of high-end strike capabilities. In December 2022, Japanese Prime Minister Kishida Fumio approved the largest increase in spending on national security in the nation's budget since World War Two, committing to nearly double spending to 2 per cent of Gross Domestic Product (GDP) by 2027. Japan's National Defence Strategy directs increased holdings of more advanced and longer-range systems in a significant enhancement of national capability.

European militaries are also rapidly rearming and modernising their forces in response to Russia's invasion of Ukraine. While it has proven politically challenging to implement, Germany is seeking to modernise and bolster the Bundeswehr (Germany's armed forces). While there has been some scepticism over how it will be funded, according to its Prime Minister, Mateusz Morawiecki, Poland is undergoing a huge military

spending spree with military expenditure set to reach 4 per cent of GDP in 2023. This includes large-scale acquisitions of Abrams tanks and HIMARS (with an initial order for 18 launchers and associated munitions, with the intent of eventually acquiring up to 500 launchers).

All this is increasing pressure on extant production capacity at a time when supply chains are still vulnerable from Covid-19-related impacts, and Western economies are experiencing workforce challenges – particularly in advanced manufacturing. As such, despite challenges in supply, global orders of military equipment have continued to increase, further exacerbating the problem. For the ADF and Army, this will prove a challenging context in which to accelerate and expand its strike acquisitions projects such as Land 4100 and Land 8113, as agreed to by government in its response to the DSR.

Key Takeaways

- Global militaries are increasing their stocks of military strike weapons in response to increasing geo-political tension.
- The 2023 DSR has made it clear that Australia will also need to modernise and expand its inventory to build a military capable of defending its interests.
- This increase is happening concurrently with supply chain issues and production shortages as a result of the war in Ukraine.

Australian Army soldiers from the 1st Regiment, Royal Australian Artillery, firing their M777A1 155mm Howitzers during Exercise Barce II at Wide Bay Training Area, Queensland.

Critical Minerals and Rare Earth Elements

Amidst increasing geopolitical tensions, military modernisation and the associated production challenges, Rare Earth Elements (rare earths) have gained more attention in the West due to their vital role in military hardware. Countries like the US, UK, France and Australia have realised the need to diversify supply chains to rely less on China, which dominates the rare earths market.

'Rare Earth Elements' is the scientific term for a collection of 17 minerals essential to making the permanent magnets used in the production of advanced commercial and military technology. The term 'rare earths' is often conflated with critical minerals, but there is an important distinction which is often overlooked. While 'rare earths' is a scientific term, 'critical minerals' is a political term. It is used to identify a group of minerals essential to the production of modern technologies and thus to a country's national security and economic prosperity. The Australian Government lists the group of 17 rare earths in a list of 26 critical minerals. The remainder of the list includes well-known materials like lithium and cobalt that are essential for the production of batteries.

Rare earths are used in the manufacturing of a vast array of military technologies including missile guidance systems, disk drive motors, communications systems and radar systems. Since the 1990s, China has produced the vast majority of the global supply of rare earths. Indeed, China now accounts for around "60% of global rare earth mined production, 85% of rare earth processing capacity, and over 90% of high-strength rare earth permanent magnets manufactured". Despite efforts over the last few years to commence diversifying sources of rare earths

– with new projects coming online and others on the cusp of production – Western nations still have a long way to go before their processing capacity reaches the levels necessary to meet the demand. While rare earths are abundant in the earth's crust, they are very complex to process without damaging the environment. Because of this, projects outside of China – where low environmental regulation and cheap labour has enabled rare earths processing to flourish – struggle to acquire the expertise needed or secure funding, due to the often prohibitively high establishment costs associated with processing facilities.

While the US often cites the vulnerability to commercial and military production from relying on China for rare earths, the existential nature of that threat is sometimes hard to demonstrate, as economic interdependence reduces the coercive potential. However, in February 2023 China imposed sanctions on Lockheed Martin and Raytheon in response to arms sales to Taiwan. The two companies were fined more than double the value of their exports to Taiwan by the CCP with restrictions imposed on their engagement with Chinese businesses. Both businesses are among the largest producers of advanced military technologies for Australia, and they rely on Chinese sources of rare earths. While it is yet unwilling to do so, China could decide to block export of rare earths all together. Such a move has precedent. In 2012, in response to a confrontation in the Senkaku/Diaoyu Islands, China restricted rare earth sales to Japan for two months. This forced Japan to rapidly seek alternative sources of rare earths and ultimately led to the Japanese Government directly investing in an Australian-listed company, Lynas Rare Earths, to ensure supply chain stability. While the short time frame meant that the effect on Japan's supply chain was limited, it demonstrated Beijing's willingness to use its dominance of the market for economic coercion.

Since 2020, the US has been reviewing its reliance on foreign sources. Both China and the West, including Australian and American businesses, have been purchasing land in mineral-rich areas of Africa over the past few years. However, political unrest, poor infrastructure and high establishment costs have meant that the necessary processing facilities have not yet been established in the region. Nevertheless, China's domestic processing capacity means that it will still be able to benefit from the resources extracted in Africa while the West is unable to process large amounts.

The US Department of Defense has provided funding to a number of rare earth producers to enable them to begin production, but it will take years for them to reach the scale required to meet demand. The negative environmental impacts of rare earth extraction and processing, and high establishment costs will continue to challenge the West's capacity to diversify its supply chains, ensuring reliance on China for the vast majority of rare earths.

The supply of rare earths may not always be guaranteed so Australia's ability to acquire advanced military technologies that rely on such material may need to be reduced. Military production lines are also competing with the growth in electric vehicles and infrastructure as countries shift towards alternative sources of power and energy. Many of these 'transitional' technologies rely on rare earths as core elements in their production. The implications of this is that demand is surging, while domestic supply will take years to develop.

To assist in reducing the reliance on China for rare earths and reduce environmental impacts, alternative materials for the production of permanent magnets are being explored. Tesla recently announced it intends to remove rare earths from the permanent magnets in its electric vehicle motors, leading some to speculate that this might cause a dent in global demand – if not a broader domino-effect. However, viable alternatives remain elusive and Tesla is yet to demonstrate how it will achieve this. Furthermore, electric vehicle (EV) motors only make up 12 per cent of global rare earth permanent magnet consumption, of which Tesla represents about 15–20 per cent. This means that even if Tesla manages to remove rare earths from its motors while retaining the performance that traditional permanent magnets offer, it still only comprises a maximum of between three and four per cent of global demand.

While the supply of 'light' rare earth elements like neodymium and praseodymium (the main elements in permanent magnets) outside of China are progressively increasing, there is greater focus on developing a non-China supply of 'heavy' rare earths such as dysprosium and terbium. This is because these elements are not only key additives to strengthen permanent magnets, but are also the key elements in military equipment like sensors and lasers. And the majority of these are still currently sourced from Myanmar through China.

Building new Western supply chains for rare earths to reduce reliance on China will not be easy, as China will fight to retain its dominance. Like typical market supply-and-demand models, China is stockpiling rare earths before releasing them, flooding the global market with cheap supply to put downward pressure on prices. This has the effect of pricing out prospective Western companies whose marginal cost of production is too high, making them unviable and unable to secure funding. Western government support is required to assist the more competitive projects through to production, as was the case with the Japanese Government's support to Lynas, which is now comfortably profitable in the face of low Rare Earth Oxide prices.

As global demand for these minerals continues to grow, efforts to diversify and reduce reliance on China need to keep apace. The US is stepping up its efforts by offering low interest loans through the Department of Energy and tax incentives via the Inflation Reduction Act. The Australian government is providing support through initiatives such as the North Australia Investment Fund and Export Finance Australia. Continued focus on supporting Australian companies to produce sovereign supply of these key materials will be vital for enabling the ADF to bolster its military capabilities and war stock through programs like the Guided Weapons and Explosive Ordnance (GWEO) program.

The Tom Price welcome sign located at the entrance to the mining town, North West Australia.

Key Takeaways

- China currently holds:
  - 60 per cent of global rare earth mined production.
  - 85 per cent of rare earth processing capacity.
  - Over 90 per cent of high-strength rare earth permanent magnets manufacturing.
- China has set a precedent by previously restricting sales of rare earths to Japan for a short period despite interdependence in their economies.
- The West is increasing its capacity to produce rare earths but supply will not meet the increasing demand for some time.
- The Australian Defence Organisation will be in competition with other countries and industry to secure the rare earths essential to the production of advanced military equipment in programs like the GWEO Program.

As part of the Northern Territory's Navy Community Engagement Program, sailors and officers from HMAS Coonawarra and Attack Two conduct a dual engagement activity with mining company OM Manganese (Bootu Creek).

Conclusion

The Q1 2023 Strategic Assessment highlights the global supply chain challenges that Army will need to overcome to secure military stockpiles. A confluence of factors will continue to challenge global supply chains that are still recovering from the Covid-19 pandemic. The ongoing Russian invasion of Ukraine is likely to see a continued flow of military equipment from Australia, Europe, the US and other partners to Ukraine which will deplete existing stockpiles in relevant donor countries. Even with the Australian Government's commitment to the future force outlined in the DSR, supply chain issues will continue to challenge Defence's capability acquisition and maintenance.

The dominance of China in rare earth production also poses a challenge to global supply chains and could see limits on production if regional tension continues to rise. However, ongoing efforts by partners like the US and Japan to diversify rare earths also poses an opportunity for Australia to build a domestic industry to ensure stable supply in an increasingly contested environment. The ability to scale-up quickly, however, is limited and the construction of processing facilities outside of China that can meet demand will likely take many years.