

# The Indian Techno-Military-Industrial Ecosystem

## Creating Cold Military Steel in an Era of Strategic Rivalry and Conflict

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A significant part of the globe is engaged currently in conflicts in Ukraine and West Asia, as also prospectively in the Pacific. Even as the conflicts simmer, glaring inadequacies have come to light in the military–industrial complexes (MICs) of nations as diverse as the United States (US), the United Kingdom (UK), Germany and wider Europe. Readiness is being reviewed and stockpile levels are being revamped with a renewed sense of urgency, driven by the realisation that what wins wars is not #hashtags and online aggression, but cold military steel. This commentary seeks to underline the key lessons in this regard, for possible adoption in the Indian context.

What should worry us the most is the overarching sense coming out of the recent conflicts, namely: in an era of war, the mighty West is unable to respond to the ensuing challenges on a war footing. The cumulative effect of atrophying Western statecraft and a corroding MIC is that the arsenal of the Global West (the US and about 50 countries) seems to be losing to the arsenal of the Global East (China and 25 odd partners, including Russia, Iran and North Korea). It is not that the West is not doing enough, it is in fact doing a great deal. However, what it is doing is just not enough to win; that is how complex and sophisticated the MIC challenge is. In a predominantly

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artillery war, North Korea has produced and transferred more artillery ammunition to Russia than the West has been able to supply to Ukraine. Till some time back, while the Ukrainians were firing one lakh, one hundred artillery rounds a week, the Americans could supply only one lakh rounds in a month. To continue to achieve localised artillery superiority, Ukraine will need 2.4 million rounds in the current year, but Ukraine's international partners, including the US, will struggle to provide half that number.<sup>1</sup>

The combat consumption is exceeding supplies by an order of magnitude. For instance, in the first six months of the fight in Ukraine, the number of Javelin missiles (anti-armour) that were fired was equivalent to what the American industrial base would take seven years to produce. Further, Ukraine needs to replace 1,800 artillery barrels annually and the resupply is nowhere near that number.<sup>2</sup> Russia is now firing over 100 ballistic and cruise missiles, as also using 300 attack drones per month. Ukraine, meanwhile, is unable to produce/replace air interceptors in the same proportion.<sup>3</sup> The slow-motion response of the Western MIC in Ukraine, including the resultant equipment and ammunition inadequacies, has led to loss of operational momentum at key junctures in the conflict. Indeed, opportunities have been lost; frontlines have not moved significantly enough in consequence; and the Russians are now in the ascendant. The much-fancied just-in-time (JIT) and surge models of production and supply have not quite worked. It does seem that if the Russians are winning, it is on account of the superior quality and delivery of the Russian MIC. That is how salient the capacity and quality of a nation's MIC is to its national security prowess.

The West has also neglected the availability of basic materials and supply chains grievously. Take the example of antimony, the very basic element needed to produce ammunition. At a time when the world is scurrying for all kinds of ammunition (no less than President Biden has been beseeching South Korea for 155 mm ammunition supplies to Ukraine), antimony mining is currently vibrant only in three locations globally: Tajikistan, Russia and China. Reports reveal that for a possible Taiwan contingency, the Americans do not have seven days of missiles and precision munitions to sustain a fight.<sup>4</sup> In 1996, the Chinese made some aggressiveness manoeuvres towards Taiwan and President Clinton moved two aircraft carriers, *USS Independence* and *USS Nimitz*, to the Taiwan Strait. The Chinese smelt the operational coffee and backed off. Today, given the operational prowess and great sophistication of the Chinese anti-access/area-denial (A2/AD) warfighting system—a product of steady and diligent nursing of the Chinese MIC—American Admirals are counselling their political bosses to keep the country's aircraft carriers 1,000

miles away from the first island chain. Further, given the severe deficits in America's MIC, a 19 billion-dollar backlog of military supplies to Taiwan remains undelivered.<sup>5</sup> Thus, a vastly strengthened Chinese MIC and a relatively weakening American MIC are impacting the salience of American power projection in the Western Pacific.

The purpose here is not to undermine the Western enterprise, but to point to the gravity and monumentality of the challenge and the need to initiate multiple transitions to plug gaps in our own deterrence and warfighting postures. So, what must we do in the Indian context? The many-splendoured initiatives under 'Atmanirbharta in Defence' (AID) have given us a wonderful, transformational start, a strong edifice, so to speak. Given the lessons of global conflicts of the recent past, however, we need perhaps to re-invigorate, perhaps re-imagine, the AID framework in terms of the following 15 pathways:

1. We need to sense and be alive to the new strains in geopolitics, namely, the decisive tilt towards hard power; the fact that wars are unfortunately back in business (*'larai nahi hone wali'* is a gross misread of the changing tea leaves of the international system); the steady gravitation of the arc of conflict to the Indo-Pacific; and the significant prospect of a Sino-Indian conflagration (particularly if China senses weaknesses in the Indian arsenal). We need to upgrade our AID enterprise to meet the needs of war. This needs to be done on a war footing so that in the near future, if India is faced with a perilous situation with China, we must not regret that we did not do enough. We must remember that while deterrence may be costly, wars are costlier. We also need to calibrate our statecraft with the contours of our AID, that is, carefully tailor our operational ambitions to the realities of AID and vice versa. Clairvoyant thinking in this regard is the essential prerequisite for AID to raise the bar and grow to its desired potential.
2. One of the biggest strategic follies of recent times has been the myth of 'short, swift wars'. The armed forces must take a fair share of the blame for subscribing to the postulate without deep scrutiny. It does seem now that for the foreseeable future, conflicts will be long in time-frame (or at least unpredictable in length), industrial in nature, with an ever-enlarging digital component. To sustain such conflicts, a vibrant, technologically enabled, innovation-driven industrial base is a necessary prerequisite. The Indian ecosystem needs major redesigning—conceptual, structural and cultural. A significant capacity upgradation in speed and scale, bathed in technological innovation, is also called for.

3. There is a need to carry out a comprehensive status audit of our ecosystem regarding readiness, stockpiles, inventory, variety and depth, technological enablement, digital capacities, supply chain autonomy and critical chokepoints, in terms of deterrence radiation as also the capacity to fight and win in high-intensity combat. The consequences of such an audit may be revealing, both in terms of great opportunities as also huge challenges. In its current state, while our MIC may be adequate to meet contingencies arising in the responses short of war (RSOW) domain, it would need significant resourcing to meet the challenges of high-intensity combat.
4. We have to initiate responses on a war footing. American studies/ estimates suggest that the Chinese production and procurement enterprise (MIC) is five to six times more efficient and faster than that of the US, which is a cause for grave concern. If we are to deal with the abject reality successfully, the Indian ecosystem will have to obviously pick up speed and scale accordingly. In other words, our stockpile levels and surge capacities will need comprehensive upgradation.
5. We need to review our strategy and stockpiles for a full-fledged, high-intensity conflict with China, and accordingly ramp up production lines. American studies estimate that in a possible conflict with China over Taiwan, the US military will expend more than 5,000 long-range missiles in the first three weeks itself. How many will we need? How many do we have? In the initial stages of conflict, the Chinese air defences will be pretty formidable, precluding most Indian Air Force aircraft from penetrating them sufficiently to be able to drop short-range munitions effectively. What is the status of our bombers and cruise missile stockpiles that can degrade Chinese A2/AD from stand-off distances? Do we need to build an A2/AD system of our own in the Indian Ocean Region to deter/degrade Chinese naval ingress in the future? Given the great success of Ukrainian missile–drone combos against the Russian Black Sea Fleet, do we need to hybridise our air and naval fleets in far greater numbers? Our ordnance factories network is a dumb munitions behemoth; it needs a comprehensive transformation to precisionary, which after all is the key lesson from Ukraine. A comprehensive review therefore is called for, across the grids of war, theatre contingencies and weapon profiles, along with precise orders for accelerated production. This will definitely be a mammoth exercise but one that India, as an aspiring great power, will have to engage in.

6. Since AID is dependent greatly on the energy and enterprise of the private sector and start-ups, we need to appreciate that the capital and personnel investments that are required in defence are so long term and huge that without a clear and consistent demand signal and a firm financial commitment from the government, such business propositions are unlikely to flourish. Private companies will not invest in plants, machinery and production lines unless there is a reasonable guarantee of orders. We need to set aside the tyranny of L-1, overcome the ring fencing of mediocrity and embrace a culture of talent identification/enablement/maximisation, that is, create national champions in defence. We need to identify talented micro, small and medium enterprises (MSMEs), start-ups and private companies and help them grow, not only to meet domestic defence needs but also in order that such entities can survive, even thrive, in the international arena. Defence majors all over the world (from China's NORINCO to South Korea's Korean Aerospace Industries Limited) have received active handholding/propping up from their respective governments. So have billion-dollar defence start-ups, like the US-based Anduril (advanced military autonomous systems) and Europe-based Helsing (defence artificial intelligence [AI]). We need to unabashedly create our own defence majors of the world, like Boeing, Lockheed Martin, Baykar (makers of Turkish Bayraktar unmanned aerial vehicles) and Space X. In our procurement framework, we need to inject new practices, that is, allow, as is the norm in many Western democracies, what are described as national security exceptions. This is a huge ask, but we need to initiate steps in this regard with dispatch. There is also an overwhelming strategic rationale to do so: proficiencies and prowess in high-end defence bring along with them huge influence and heft in the international system. National champions in defence of a distinctively Indian hue will contribute substantively to India's quest to be a power of consequence.
7. The hallmark of AID is innovation. We now need to resource the culture further and take innovation to a new high. Defence innovation is premised on risk taking, acceptance of failures, surgical reduction of costs and compression of time-frames in delivery. This will entail a major break from the norms and practices of the past and call for a massive leap of faith. It will need a new culture of leadership and industrial outlook. Defence, today, is so sophisticated and complex that it needs complete dissolution of silos, massive cross-pollination and injection of

new talent pipelines (coders, gaming enthusiasts and computer geeks) from across domains, such as civil and military, public and private, MSMEs and start-ups, academia and research and development hubs, to come together. The AID could be both a driver and platform for such convergence, leveraging civil–military fusion to propel our national security endeavours to an unprecedented high.

8. The firmament of military–industrial futures is not static; it is, in fact, one of continuous and humongous change. When it comes to many of the defence systems, missiles, munitions and machine tools of tomorrow, the monopoly unfortunately is that of China. In cast and forged products, advanced battery supply chains and other critical components, China leads. We will have to step up the game in resourcing cobalt, copper, lithium, nickel, anodes, separators and electrolytes if we are to become a player of consequence in the 59 materials that are deemed to be critical in the strategic–military sense. Therefore, AID needs to develop a precise and forward-looking philosophy in supply chain statecraft. Take the chip, for example: from sand to finished product, the process passes through 70 countries. Many high-end defence systems need the most advanced of chips (3 nm) to drive their efficiencies. As it is impossible to master the supply chain in its entirety, we will need to carefully examine what value additions of the supply chain we could occupy a position of primacy in. It is evident that AID will have to overcome such like challenges.
9. A transition to digital combat is critical because in the data domain, the margin for error is shrinking, the decision cycles are shortening and the attack surfaces are growing. We need to treat data as a weapons system and align the orientation of AID to digitise our combat philosophy and systems; in other words, we need to manage, secure and use data for superior operational affect. Software in defence is now a streaming product and intelligence/targeting data from a satellite system to an aircraft cockpit, a forward poised divisional headquarters or to an aircraft carrier out at sea will be available as subscription from a defence major. In this regard, AID is the natural instrument to facilitate Indian military's transition to digital combat.
10. The one lesson coming out of recent conflicts is a fundamental transformation in the nature of airpower, space, the gun–missile–drone and air defence complex. Look at the underwhelming performance of Russian airpower in Ukraine, both in terms of air supremacy and interdiction. Drones and Storm Shadow missiles, on the other hand, have combined to degrade the Russian Black Sea Fleet significantly. Iran

made intelligent use of the Ukraine theatre as a laboratory to upgrade their dronery and passed the capability on to Hamas, who used the same with telling effect to penetrate the formidable Israeli Iron Dome system on 7 October 2023. Another significant development, in recent times, is that firepower is no longer siloed in terms of intelligence, surveillance and reconnaissance (ISR; combat and open-sourced intelligence) artillery, air, armed drones, air defence, etc., but has been aggregated through networks, algorithms and coding into Integrated Kill Chains. It may be wise to reconfigure AID in terms of these capacities/developments, particularly that of Integrated Kill Chains.

11. The AI and Deep Tech (the onset of a wave of game-changing technologies) are transforming deterrence and warfighting in unprecedented ways and may be the secret sauce in concert with civil–military fusion for the asymmetric addressal of China. Indeed, AID will have to gear up for the new reality and grab the obvious opportunity. It must assist the defence services in growing their compute power, in unlocking their data and using these datasets to train defence-specific Large Language Models (LLMs). China, today, has approximately 238 LLMs (critical for generative AI). Given their great penchant for civil–military fusion, a large number of these would be deployed to sharpen their military prowess, across all grids of war and domains, from sensors to fires to precisionary, through AI enabled in flight updates, command and control, decision making, the observe, orient, decide and act (OODA) loop, logistics, etc. Our AID must calibrate its poise to enable the transformation of the Indian military into an AI-driven combat force. We also need a ‘Sainya Semiconductor Mission’ and a ‘Sainya Quantum Mission’ to complement the missions that have already been rolled out in the civil space. BharatGPT needs a digital twin in defence too. Another area that AID must focus on is in creating IP in defence. In the long run, it is this refined IP that will separate the men from the boys.
12. Technology collaboration with international partners is paramount. We must concede in all humility that since our AID is in a state of relative infancy, we will need collaborative pathways with international partners, especially in domains like Initiative on Critical and Emerging Technologies (iCET). Co-designing military applications in AI, partnerships in military autonomy, high-end sensors and space through instruments like INDUS-X or Quadrilateral Security Dialogue (Quad), for instance, would be a good start. Our AID must energise such collaborative pathways. It must also enlarge prospects of co-production/

co-sustainment/technology sharing through projects, like the Tata–Airbus deal or the FE-414 jet engine deal. These bigger deals, in turn, will trigger significant ripple/downstream effects, in terms of strengthening the wider MSME/start-up ecosystem. An Indian start-up, 3rdiTech, for instance, has already signed a memorandum of understanding with General Atomics to build precision guidance kits for the MQ-9Bs (Predators). The US Space Force has signed a cooperative research agreement with another Indian start-up, 114 AI, to build capacities in domains that touch all iCET areas of excellence, to include an AI-based tool for space domain awareness and semiconductors. As life becomes more interplanetary and strategic military competition to include warfighting shifts to space and beyond, now is the time to step up the game in these emerging domains, from under sea to the stars. The AID must be a significant catalyst in this regard. Such initiatives will set into motion events that will give a fillip to India's status as an aerospace and maritime power of consequence.

13. As India steps into big power competition, we will need to pay far greater attention to the numerous facets of strategic deterrence than we currently do. The nuclear domain, missilery, space, cyber, long-range precision, stealth capacities and enablers, like air-to-air refuellers, tankers and hypersonics, are areas where our primary adversary, China, has demonstrated phenomenal progress. These domains have a deep connect and will have an overwhelming effect on conventional operations; they, therefore, need far greater resourcing with a dedicated industrial base. In addition to the aforementioned capacities, the creation of silos, survivability enhancement measures, missile defence upgrades, creation of wind tunnels for testing and unique supply chains are some of the components of such an industrial base that must get our concerted attention.<sup>6</sup>
14. The proposed restructuring of the AID enterprise will be an expensive proposition. It must, therefore, be premised on the metrics of an affordable risk equation: a smart trade-off between what we must spend to deter; the monies we would need to fund sustained, high-intensity combat; how we could offset combat differentials through innovation and international technological collaboration; and what we could hold off by way of acceptable risk. The endeavour must be to imaginatively add military muscle without spiralling costs. The US's defence budget is approximately three times that of China. China's defence budget,

similarly, is three times that of India, yet Beijing seems to be doing a better job of creating displacement anxiety in Washington than New Delhi does in putting Beijing off-kilter. In the phase that China's military prowess transformed and zoomed, China's defence spending actually came down, from approximately 2.5 per cent of gross domestic product (GDP) in 1997 to 1.7 per cent in 2022. So, the creation of a potent defence ecosystem is not a function of money alone. Also, initiating, declining or postponing war/conflict is premised on strategic intent, but as noted by American strategic affairs expert Elbridge Colby: 'Capability is the father of strategic intent'. The quality of our AID, therefore, will be germane to our strategic posture with a strong bearing on intent and must be developed with due thought and care. The wise bottom-line would be not to sleepwalk into a conflict that we are not prepared for.

15. In the long term, AID must also help India grow into this responsible, benign defence powerhouse, not only to secure our territorial sovereignty and interests worldwide but also as an instrument of business, commerce and geostrategic heft. If as many as seven Chinese defence majors rank in the top 20 defence entities in the world, we need to be similarly competitive. Military hardware, digital competencies and strategic-military prowess are increasingly becoming key attributes in determining the global pecking order. We must never forget the wisdom of Swami Vivekanand, who stated: 'the world after all is a gymnasium where nations come to make themselves strong'. We must do all that we can to create a vibrant, and as indigenous as possible, Indian MIC, an essential prerequisite for India to attain its place and promise in the world.

## NOTES

1. Jack Watling, 'The War in Ukraine is Not a Stalemate', *Foreign Affairs*, 3 January 2024, available at <https://www.foreignaffairs.com/ukraine/war-ukraine-not-stalemate>.
2. *Ibid.*
3. *Ibid.*
4. Seth G. Jones, 'The U.S. Defense Industrial Base is Not Prepared for a Possible Conflict with China', Center for Strategic and International Studies (CSIS), 22 February 2023, available at <https://features.csis.org/preparing-the-US-industrial-base-to-deter-conflict-with-China/>, accessed on 6 January 2024.

5. Joe Gould, 'Slow Arms Deliveries to Taiwan Blamed on US Production Bottlenecks', *Defense News*, 24 February 2023, available at [www.defensenews.com/pentagon/2023/02/24/slow-arms-deliveries-to-taiwan-blamed-on-us-production-bottlenecks/](http://www.defensenews.com/pentagon/2023/02/24/slow-arms-deliveries-to-taiwan-blamed-on-us-production-bottlenecks/).
6. To get an idea of what we could possibly do, see Heather Williams, 'Project Atom 2023: A Competitive Strategies Approach for US Nuclear Posture through 2035', Report, CSIS, September 2023, available at <https://www.csis.org/analysis/project-atom-2023>.