

Future Battlespace

Embracing Change in the Future of Warfighting

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CHANGING CHARACTER OF WARS AND THE TECHNOLOGY CONSTRUCT

War has an enduring nature and an evolving character.¹ The nature of war is the unchanging essence of its moral and physical characteristics, regardless of shifting motives, dimensions of war or technological advances. The character of the war, on the other hand, changes with evolving actors, approaches, technological progression and ideologies. This applies, equally, to military leadership: it too has an enduring nature of core values-cum-ethics, and an adaptive, dynamic character, driven by a multitude of challenges, including

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1 Lt. Gen. AB Shivane, “Eleven Big Lessons for the Employment of Tanks in Future Battlespace: The Russia – Ukraine Conflict”, *CLAWS* April 29, 2022, <https://www.claws.in/eleven-big-lessons-for-the-employment-of-tan-ks-in-future-battlespace-the-russia-ukraine-conflict>.

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technology, battlespace dynamics, complex command functions and evolving doctrines.

Based on the same analogy, war has an art and a science component. The art of war – its human dimension – is all-enduring, like the nature of war; and the science of war – its technology dimension – constantly evolving, like the character of war. Art is to visualise, describe, direct, and lead; and science is to understand, adapt, exploit, and optimise.

The art of war thus centres around leadership and strategy, to intertwine material and physical forces with moral forces. It is a ‘clash of wills, not machines’,² in which means must be subordinate to ends if the results are to justify the costs. The science of war changes the character of warfare, yet technology never rules warfare, but presides over warfare. Technology defines and governs warfare, yet this connection is not deterministic. It sets the stage for warfare and is its instrumentality.³ Technological superiority manifests in superior outcomes when military leaders are trained and educated to employ it effectively, with individual proficiency, collective mastery, and adaptive skills. Thus, gaining a technological advantage over an adversary will be a function of an adaptive and thought leadership, attuned warfighting doctrines, matching and prioritised capability-building and transformed Professional Military Education.

2 Williamson Murray, “Technology And The Future Of War”, *Hoover Institution*, November 14, 2017, <https://www.hoover.org/research/technology-and-future-war>.

3 Lt. Gen. A B Shivane, “Technology and Leadership Challenges in the Digital Battlespace”, *Ministry of Defence*, Sri Lanka, May 2, 2022, https://www.defence.lk/Article/view_article/4512.

TECHNOLOGY-ENABLED FUTURE BATTLESPACE OF THE 21ST CENTURY

Without going into a detailed analysis of the geostrategic global environment, it is sufficient to say that the established equation of global and regional power has been subverted and a new ‘global disorder’ is emerging. Power transition theory says that the fall of a dominant great power and the rise of an ascendant challenger often result in instability. New geopolitics and strategic competition, rapid changes in technology, demographic shifts, urbanisation and climate change are all causing disruptions. The important issue to understand is that the enveloping chaos will inevitably seep across borders, creating greater instability, social turmoil and conflict of different dimensions and in multiple domains. It may be romantic to argue that ‘this is not the era of war’, but the reality is ‘peace is a temporary equilibrium and war a constant’. War and competition will remain part of human endeavour and states will continue to seek strategic advantage. Thus, it cannot be business as usual in the 21st century.

21st-century wars have witnessed a tectonic shift in the goals of war, the rules of war, the players and the instruments of war, reshaping its character and multiplying its domains. Possibly the most disruptive changes in warfare have been driven by technology, signaling the rise of a techno-military culture. With globalisation and the technology boom, a new term ‘Geo-technologies’ has emerged, which has become a tool of strategic competition and power play. At the centre of this contest is technology, a driver for economic, political, diplomatic and military power. The world is going through a technological and scientific revolution that, in every respect,

rivals the great “military-social revolutions” of the past.⁴ But unlike the period from 1914 through 1990, when military organizations were the primary drivers behind revolutionary changes in technology, the current period looks quite similar to the period before 1914, when factors outside the military were largely responsible for the technological revolution. The key issue, however, remains that technological changes are occurring at a pace faster than war fighters, legacy structures and conformist war doctrines can absorb, making military adaptation to future complexities of combat a challenge.

Yet military technology remains an outcome of civil-military fusion and the Defence Industrial Base, which remain nascent and displaced in the Indian context. Budgetary allocations add to the woes. We need manufacturing prowess and homegrown technologies, not acquisitions that are decided on domestic politics, rather than strategic considerations. The need is to understand the specific challenges at the national and military level that we face in case of a war or the even more dangerous blend of the present conflict below the escalation level. The nation needs greater accountability and responsibility rather than passing the buck amongst all stakeholders.

Crucially, what has been, and could be the role of the Private Sector in supporting national defence priorities? What has been the limited experience of success and failure, and of accountability, in the limited experience with the Private Sector in the past? The key challenges for India remain fiscal funding on technology research and development (R&D) and complementary human resource development, which remain subpar.

4 Murray Williamson, “The Future of War: Of course we need high-tech weapons. But with great capabilities come great vulnerabilities”, *Hoover Digest*, Issue 3, 2018, Gale Academic OneFile, link.gale.com/apps/doc/A547757985/AONE?u=anon~aec87598&sid=googleScholar&xid=ba2d0cb3.

India's principal security challenge comes from China, and Beijing not only allocates very large resources to R&D, but has also made scientific and technological leadership the focus area in its drive to become the world's economic dynamo, the power centre of a new geopolitical order, and a global military power. We cannot have dependencies on China by way of an imbalanced trade both qualitative (infrastructure and ICT) and quantitative, if we are to enhance our national deterrence against future threats.

The development of disruptive technologies over the past decade has taken warfare to a different plane and entered an era of Disruption in Military Affairs. This current technology tsunami will impose the greatest challenges on the military leaders and warfighters, to comprehend, adapt to, and optimise their force multiplication effect. The future technology-shaped battlespace will be characterised by:⁵

- **Digit, digitisation, digitalisation and disruption revolutionising the battlespace.** This has resulted in the overwhelming execution tempo of operations, enabled by rapid decision-making and the concurrency of action made possible by leveraging artificial intelligence and machine cognition. The overwhelming technological imperative driving military engagements will continue to be the competition between, on the one hand, detecting and precision-targeting the enemy at an increasingly longer range and, on the other, avoiding detection by enemy sensors and surviving engagements.

5 Lt. Gen. A.B. Shivane, "Military Leadership Challenges in the Future Technology Embedded Battlespace", June 12, 2022, *Raksha Anirveda*, <https://raksha-anirveda.com/military-leadership-challenges-in-the-future-technology-embedded-battlespace/>.

- **Enhanced visibility**, not only to warfighters but also characterised by higher political, media and public visibility, resulting in greater scrutiny, interference and counter-narratives by adversaries. Military leaders will not remain isolated from its fallout and thus must be trained to function and work through chaos. Technology has transcended the traditional battlespace impacting society and *weaponising all instruments of national power*. At the military level, the competition between hiding and finding requires, first and foremost, highly competent, proficient, and disciplined personnel. *High-technology weapons demand high-quality personnel*. As Russia's war in Ukraine has shown, the lethality of modern precision weapons has dramatically shrunk the margin for error; a single cell phone on a public network, for example, can quickly doom a unit.
- **Ascent in the levels of volatility and uncertainty with lower predictability and enhanced diversity**. Clarity of thought and focus along with the ability to make technology-aided decisions in such situations will be a critical ability. This will also require a shared view of the goals and a more collaborative joint service technology interface. It is therefore essential for the military leader to know how to use these new technologies and how to keep control of the use of new systems integrating a certain form of autonomy. Yet the military leader will need to preserve the very essence of his identity, to give meaning to military action and command to achieve his goals. The essence will be to train for certainty and educate for uncertainty. We would need to have a different perception of Time, Space, Force and Information as operational tools of warfare. We also need to empower and stand by

our brave frontline warfighters. So far, the tactical leadership has done us proud, carrying the operational and strategic commanders on the shoulders. We need to invest much more in Operational and Strategic level leadership.

- **Diffusion of technology** will make it more accessible and difficult to distinguish foe from friend. Technology in the hands of non-state actors is no more an aberration. The convergence of new technologies will provide such actors access to relatively cheap, standoff, autonomous weapons.⁶ Therefore techno-military leaders will need to adapt at the tactical and technical levels to deal with these challenges created by emerging technologies.
- **Knowledge and Adaption** will be the most valuable qualities for decision dominance. Military warriors will need to be trained to integrate, adapt and exploit technology for military advantage. Knowledge leads to adaption and adaption leads to outcomes. Technology friendliness will make them accept technological transformations with great ease, which would impact positively on the superior execution of their operational tasks and command functions.
- Finally, **in the age of long-range engagements, communications are going to play an even more critical role in military operations**; the role of sensors and real-time targeting will make reliability and redundancy in communication networks even more important in future conflicts, **which in turn requires dominating the electromagnetic spectrum.**

6 T.X. Hammes, “Technology Converges: Non-State Actors Benefit”, *Hoover Institution*, February 25, 2019, <https://www.hoover.org/research/technology-converges-non-state-actors-benefit>.

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Cyber warfare at the strategic, operational and tactical levels will have its fallouts.

In these conflicts, the contact and non-contact warfare dimensions have reached new milestones, and this has greatly influenced the leadership construct. Autonomous fighting platforms, cyber warfare and Unmanned Aerial Vehicles / Drones have already begun to impact warfighting strategies. Directed Energy Weapons, Nano Technology, Quantum Computing, Big Data Analysis, the Internet of Things and Artificial Intelligence will have a transformational impact on the planning and conduct of warfare and will revolutionise traditional notions of force planning and force application. The massing of effects and influence, rather than the massing of forces and weapons, will gain criticality, with swarming manoeuvres threatening survivability.

For the military to generate an integrated advantage in such a complex and ambiguous environment, it will have to shed its erstwhile cloak and build on new ideas, evolve structures, and redefine the link between technology and war fighters. War fighters will need to have a scientific temper, defined as “a modest open-minded temper – a temper ever ready to welcome new light, new knowledge, new experiments, new technologies, even when their results are unfavourable to preconceived opinions and long-cherished legacy theories.” We cannot remain trapped in past paradigms nor rest in self-generated idealisms of the future.

LEADERSHIP CHALLENGES IN THE FUTURE TECHNOLOGICAL BATTLESPACE

In today’s high-tech multidomain battlespace, decision superiority is arguably what would make the difference to prevailing in war. While enabled by technology, the commander’s education, experience, and judgment become

critical factors in making sound decisions.⁷ The military is often awed by technology transforming the character of war but frequently neglects this human dimension and capability of the warrior. Technology is critical but must be built into doctrines, structures and Professional Military Education, to develop tech-savvy leaders who can not only think strategically, critically, and creatively, but also adapt and exploit their capabilities, interdependencies, and vulnerabilities. The need is for enhanced man-machine synergy to identify, navigate and prevail in a multidomain environment. Steve Jobs reminds us,

Technology is nothing. What's important is that you have a faith in people, that they're basically good and smart, and if you give them tools, they'll do wonderful things with them. It's not the tools that you have faith in – tools are just tools.⁸

Thus, technology without human expertise is no more than an unexploited tool.

No technology can serve as a substitute for sound policy and flexible strategy. However, the critical challenge defence forces face is not how emergent technology will deliver outcomes, but rather it is the *reshaping of military bureaucracies, higher leadership mindsets and war doctrines* that will define the way we understand, integrate and use technology. The fact is, Defence Forces and their strategic leadership are conservative by nature, *status quoist* by culture, and thus guilty of preparing for not only the last war but the wrong war. The result is that

7 Vice Admiral Ann Rondeau, U.S. Navy (Retired), “Rebalancing The Science And Art Of War For Decision Advantage”, *Proceedings*, US Naval Institute, Volume 148/8/1,434, August, 2022, <https://www.usni.org/magazines/proceedings/2022/august/rebalancing-science-and-art-war-decision-advantage>.

8 Jeff Goodell, “Steve Jobs in 1994: The Rolling Stone Interview”, *Rolling Stone*, January 17, 2011, <https://www.rollingstone.com/culture/culture-news/steve-jobs-in-1994-the-rolling-stone-interview-231132/>.

technology and warfare continue to evolve faster than military leaders and soldiers can adapt to.⁹

The challenge is to build adaptive and versatile leadership attuned to emerging threats. Adaptability is a cognitive quality and cannot be guaranteed by technology. This would require management of Human Resources (HR) policy changes in how we induct, retain, train and fight, to win the technology war. Versatile leaders come from a sound understanding of concepts. If the military continues down the path that ‘technology is not our business’, they will never know how that technology can be used to their advantage. That doesn’t mean we need warriors who can write code, but rather military leaders that understand how the technology is developing and can be applied. *Management of change requires cultural change, which remains the greatest challenge and a possible retarder.*

REALITY CHECK: TECHNOLOGY AND LEADERSHIP

Technology has its underpinnings and leadership dynamics, which need to be understood and addressed to optimize capabilities in future wars.

- When a new technology first appears, the leadership has no idea what to do with it, which leads to confusion and a failure to respond. This is because the **technology cycle manifests faster than the leadership adaption cycle**, and the doctrinal change cycle is even slower than the leadership adaption cycle. Thus, culturally, there is resistance to change and technology remains more spoken of than exploited.
- **Technology without integration, or a doctrinal underpinning, is the hype before the let-down.**

9 A.B. Shivane, Lt. Gen., op. cit., 2022.

Sun Tzu warned, “tactics without strategy is the noise before defeat.” Artificial intelligence and autonomous machines are likely to be among the greatest military integration challenges due to the additional complexities they create for network architectures. Further, operational doctrines must ideally drive technology induction strategy, for a nation with a strong technological military-industrial base. In the interim, technology availability must result in adaptive operational application.

- **Technology compels integration and jointmanship.** Joint training and equipping of forces must become key aspects when we integrate technology for optimising joint force capabilities. The status quo culture and individual service mindset retards its exploitation.
- **Technology requires matching investment in both R&D and human resources.** Technologies improve operational effectiveness and are often assumed to lower manpower costs in the burgeoning revenue budget. The statistics are more complex and contrary. At the macro level, the manpower shifts from foreground to background technical support staff. It puts greater demands on increased training for operators and specialist support, thus increasing costs in time, training, and experience. The reality is that building a future force that incorporates technological empowerment won't necessarily lower the revenue budget, but it will certainly lead to increased readiness and a more effective force.
- **The quantity has its quality and thus boots and tracks on the ground count.** This is true particularly when nations have disputed and turbulent frontiers.

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Also, high technology has not replaced but supplanted low technology in land warfare. Every technology is a transition and has limits.

DETERRENCE, MILITARY STRATEGY AND REVITALISING DOCTRINAL CONSTRUCTS FOR THE FUTURE

The pendulum of impending threat on our turbulent disputed borders will continue to sway in terms of the competing challenges of gaining ascendancy in the strategic and operational space, time, force and information domain. To achieve their political aims, our adversaries are more likely to exploit a combination of the plethora of options available at the lower end of the spectrum of conflict. This translates into the imperative of honing our conventional deterrence, empowered by doctrinal reviews and complementary technology induction, against the revisionist strategic culture of our adversaries, ranging from brewing proxy wars to incremental territorial transgressions.

Deterrence in the Indian strategic security construct is aimed at punitive deterrence (assured retribution) on the western front, and dissuasive to credible deterrence (defensive) on the northern front. Our deterrence has been repeatedly put to test in the recent past, and ironically led to the exposure of strategic and operational doctrinal voids and vulnerabilities. These are being addressed expeditiously but need greater time-critical resources, founded on a doctrinal reconstruct. At the tactical level, the courage and valour of our brave hearts have given the aggressor more than a nightmare, but at an avoidable cost to precious lives. At the operational and strategic level, we need a doctrinal reconstruct to keep pace with the realism of evolving geopolitics, the character of war and emerging threats to national security.

India's military strategy entails managing threats on its disputed border by a 'defensive holding' psyche, with an attrition-based 'force-on-force' application, rather than an 'offensive domination and manoeuvre warfare' orientation. While the erstwhile orthodox Defensive Strategy has been doctrinally replaced by a Proactive Operations Strategy after Operation Parakram, its defensive character and reactive mindsets remain deeply embedded as a legacy of the past. *The focus must be on 'dominating spaces' instead of universally 'holding ground' with manpower.* The concept of 'Pre-emption, Dislocation and Disruption' as the three empirical means of defeat, as stated in the Indian Army Doctrine, requires greater technological teeth, offensive reorientation and integrated force restructuring.

At the strategic political-military level, we need to review our approach to state versus state, and state versus non-state, threats. As a nation with disputed borders and inimical neighbours, our military must orient essentially for the state versus state conflict and adapt to the state versus non-state threats. The severity and consequences of the former are greater, and require greater capability building. India, for the foreseeable future, will thus need to balance its force structure to counter existent threats to its continental, aerospace and maritime domains, while simultaneously building military capabilities in equally critical future domains like AI, IW, Space, Cyber, etc. *The counter-insurgency or state versus non-state domain must be progressively handed over to the duly empowered PMF, CAPF and state security machinery.* The Armed Forces can ill afford to dilute their focus at the cost of their primary threat.

At the operational level, the need is to pre-empt, dislocate and disrupt enemy forces. Pre-emption implies initiating decisive

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operations before the enemy does, thereby dictating terms on the battlefield. The tools for these will be both kinetic and non-kinetic with information warfare and technology opening new vistas. We thus need an agile, versatile technology-enabled and aggressive integrated force structure led by receptive, adaptive and versatile leadership. Our Operational Commanders need to review their force deployment, force orchestration and application matrix, with greater offensive intent and teeth.

At the tactical level, a defensive and reactive disposition culture, with the predictability of response, remain shortcomings. Thus, the initial initiative remains with the adversary, as seen in Kargil and Ladakh, leading to repeated operational and tactical surprise. One critical void has been the inability to discern enemy intentions through an integrated C5ISR (Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance, and Reconnaissance) architecture. The prevailing fragile situation on our disputed borders mandates an integrated C5ISR networked decision support system, integrated with state-of-the-art precision targeting, as part of our joint force's future capability. It must lead to the evolution of a fused integrated layered mix of sensor grid architecture that is pervasive, persistent, survivable, and enduring. Joint C5ISR operations must thus be integrated into the overall operational philosophy and warfighting doctrine and not managed or be a standalone capability. This must, alongside, embolden tactical leaders to be proactive and decisive even under conditions of ambiguity, to dominate the decision cycle and initiative.

The future operational philosophy will need to focus on a 'capability-based approach with deterrence based on denial'. Capabilities must optimise future technology exploitation in all domains and agile force structures must deny future

threats by superior operational orientation. Capabilities must be a logical proactive fallout of the Operational Doctrine and Philosophy and not just a resource-centric reactive approach based solely on a response to the threat. It must, thereafter, address the resource requirement and HR requirement with balanced weightage.

Further at the strategic and operational level, there is a need to comprehend the two basic concepts of ‘denial versus defence’ and ‘holding versus domination’. Denial seeks to make conflict/coercion look bad to the enemy, while defence seeks to make conflict/ coercion better for oneself by stalling the aggressor. Denial is proactive and defence is reactive. Similarly, the ground holding mindset brings in a reactive ethos and predictability, whereas domination brings in aggressiveness and unpredictability. This is the essence, and something the Indian military would do well to differentiate and arm its deterrence capabilities with a denial and domination strategy.

DESIRED FORCE GENERATION CAPABILITY

The desired force generation capability matrix¹⁰ entails:

- **Surface to Space Continuum.** To achieve knowledge dominance, precision effects and operational speed, the land forces must graduate from their traditional two-dimensional spatial orientation to a vertical and cognitive integrated third-dimensional manoeuvre. The vertical component must include HALE UAVs, UCAVs,¹¹ drones and airborne cum space satellite

10 Lt. Gen. A B Shivane, “Restructuring for India’s Disputed Borders: An Appraisal”, *CLAWS Journal*, Volume 14, Number 2, 2021, pp. 46-61, <https://nbn-resolving.org/urn:nbn:de:0168-ssoar-77310-2>.

11 High altitude long endurance unmanned aerial vehicles, unmanned aerial vehicles, and unmanned combat aerial vehicles.

systems (including decentralised launch on-demand capability) for ISR, SATCOM and PNT¹². These must result in technology-empowered, integrated, lethal, lean, modular, survivable and manoeuvrable forces, with superior joint force synchronisation, operational orientation and intrinsic operational endurance.

- **Graduating from Jointness to Interdependence.** The level of interoperability and complementarity between land, sea and aerospace must achieve the desired speed, economy and operational acceleration. This will result in precision fire and dominant manoeuvre in near-simultaneous applications across the entire battlespace and beyond. The challenge lies more in the cultural silos mentality, lack of trust and service-centric mindsets.
- **Modular and Scalable Force.** Time is the enemy of a force that depends on knowledge and tempo for effectiveness. Force application must be on an escalatory matrix, by modular and scalable forces, while *in situ* forces with inherent reserves provide immediate pre-emption capability. These forces need to be technology-enabled and tailor-made, based on a mission-oriented grouping.
- **Superior Decision Dominance and Kill Capability.** Network-enabled C5ISR systems for dominant battlespace awareness and decision superiority will turn the tide. The field army must see deeper, see with greater accuracy and more persistently than our adversary, with shared situational awareness. Network-enabled command and control must generate

12 Intelligence, surveillance, and reconnaissance; satellite communications; and positioning, navigation and timing.

the ability to coordinate dispersed forces, to generate combat overmatch at points of decision with faster speed and overwhelming executing tempo as compared to the enemy. Stand-off precision, kinetic and non-kinetic strike capabilities, and manned unmanned systems fusion will win the firefight. These must be complemented by cyber and information warfare capabilities.

- **Combined Arms Integrated Force Structure.** What makes combined arms manoeuvre more potent than the sum of physical employment of multiple arms on the battlefield is its cumulative and complementary impact. This targets the enemy's will and ability to resist or respond effectively. The key to force constitution would essentially be based on intrinsic combat, combat support and logistics elements including Attack Helicopters, UAVs, Air Defence, Artillery and C5ISR capability. However, their combat effectiveness would be a factor of rapid deployment ability, integrated training, interoperability, complementary capabilities, and the competence of commanders to synchronise their effect.
- **Technology Empowerment.** The *mantra* is quality over quantity and capability over capacity. The requirement is for knowledge-based, decision-oriented and technology-empowered lean and agile forces, to execute missions faster and with greater effect. Technology must empower smaller brigade-sized forces to execute missions faster and with greater effect, previously thought suitable only for divisions.
- **Empowered Leadership and Directive Style of Command.** Knowledge of joint force application and

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technology exploitation of battlespace will result in decisive outcomes. Risk-taking, audacity and offensive orientation are essential for success. Thus, along with technology induction and restructuring, we must focus on moulding a competent techno-savvy leadership with a directive style of command, emphasizing traits such as creativity, aggressive and proactive disposition, and nonlinear thinking.

FRAMEWORK FOR MILITARY LEADERS IN THE FUTURE OPERATIONAL ENVIRONMENT

The Indian military dons the mantle of being one of the most operationally committed forces, with diverse sectors and threat manifestations mandating sector specialist technologies. It has active frontiers, rather than just turbulent borders. In such a multi-domain and multi-terrain environment, high-tech operations will require techno-savvy thought leadership at the theatre operational level, as well as multi-skilling and multiple competencies in tactical leaders, with both cognitive and technical competence to prevail in a future conflict. The challenge remains technology specialisation and operational continuity, within the gambit of the present HR policy of rounded sector profile and a chronic budgetary crunch.

At the theatre strategic and operational level, the requirement is for leaders with a 'scientific temper'. They also need to optimize the technology thresholds of their command and contribute to combat overmatch, both in war and active or passive peace. Active peace employs proactive, offensive and coercive military and non-military means to achieve national security goals, such as China's Ladakh transgressions and coercive policies. Conversely, passive peace has a defensive connotation of ensuring peace by inbuilt resilience and a reactive disposition, to deter threats and ensure the furtherance

of national security goals, as in the Indian context. The strategic military leadership must be educated in both.

At the operational level, we need ‘Thought Leaders’ adept in the theatre operational art. A thought leader is a combination of an outstanding thinker (strategic, insightful, and creative) and an outstanding leader (daring, inspiring and empowering).

At the tactical level, we must invest more in the creative and bold employment of theatre-specific technology for combat effectiveness. Technologies such as C5ISR, Electronic Warfare (EW), AI, voice recognition, UAVs/ UCAVs, and Unmanned Ground Vehicles (UGVs) must lead to a more preemptive and aggressive disposition and to decentralised decision-making, for superior situational awareness and decision dominance, duly supported by kinetic and non-kinetic all-weather precision strike capabilities.

Further, mastering language skills and local dialects of adversaries must go beyond just translation and lead to a larger cognitive understanding of the psyche and mind of the adversary, to preempt and dislocate him. This would require institutional specialisation and continuity which may mandate integrating non-uniformed specialists through gateways like the Territorial Army (TA).

Military leaders must also imbibe operational and strategic thinking, intellectualism and communication competence, commensurate to rank and appointment. The need is to develop ‘Strategic Awareness Competence’ for junior officers to deal with unconventional warfare, including perils of real-time media coverage, and information warfare; and ‘Strategic Thinking Competence’ for senior officers, to understand the politico-military dimension of contemporary war and peace.

In terms of technology, the military needs to identify each sub-sector’s dynamics and priorities to empower sensors,

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decision makers and shooters (kinetic-non kinetic as well as manned-unmanned). The *mantra* must be, '*See Deep persistently, Decide First even under ambiguity, Coordinate with speed, and Win the firefight, at least cost and in minimum time*'. The priorities to address the voids both in technology and HR, and the roadmap for empowerment will be the command function of the uniformed fraternity of the day.

TRAINING OF TECHNO-MILITARY LEADERS

The military leader must be firmly grounded in the fundamentals of tactics, technology, and leadership. This will require a greater fusion between education and training. Leadership must have an optimal blend of the art and science of leadership skills. We are presently getting a sub-optimal blend of the science of warfare. The lack of this facet leads to technophobia, and resistance to technology adaption, which is critical for future wars. Conceptual and technical skills will provide the capacity to perform effectively in these conditions. Thus, as the defence forces transform to meet emerging security challenges, and review modernisation, restructuring, and doctrine, it is imperative we also examine our complementary approach to military education. Future leadership will have to be collaborative, based on a shared vision, joint ownership, mutual values and technology-interfaced decision-making, while shunning bureaucratic cultural retardation. Leaders will have to deal with an entirely new set of intellectual, cultural and equipment challenges that did not exist even a decade ago. Skilling and specialisation at tactical levels along with continuity of 'on-the-job' experience will be required. This will impact not only recruiting patterns and training methodology, but may also mandate a review of outsourcing of specialists. Similarly, technology training and capsules, aided by digitised systems, will be required for higher military leadership training to bridge the gap.

The following merit attention:

- The present training curriculum and infrastructure are not empowered to adapt/acquire/exploit niche technologies like AI, robotics, quantum computing, swarming, etc., in training and exercises/wargames. This has resulted in inadequate integration of non-contact vectors of emerging technology in the current methodology, which continues to deal with it in silos. These shortcomings must be addressed. The time is ripe to wean away from the traditional outlook towards professional military education (PME) and inculcate more dynamism and enhanced technical thresholds in all ranks. Disruptive technologies must be embraced through institutionalised intervention and the development of core competencies. Future PME must integrate Cyber Warfare to overcome disruptions, AI and Big Data analysis to shorten the observe–orient–decide–act (OODA) loop and overcome information overload, nanotechnology to reduce size and signatures, space-based applications, quantum computing and hypersonic technologies. The focus must be on absorption, adaptation, integration and exploitation, rather than the technicalities or codes.
- Training empowerment for future technologies would require dynamism and a review of soldiers' technology threshold, training curricula, training methodology, and tools to deliver, assess and unlearn to relearn future warfighting methodologies. The modern tools for digitised training like immersive technologies, e-learning, distance learning, intranet, and CD-ROM, must blend with existing training methods. The key is a shift from 'Training Delivery to Learning

Acceleration’, in keeping with the dynamic operational and technological environment.

- Training curricula must also be empowered to include a functional understanding of technologies. This would require a *technology soldier fusion*, beginning from induction, and pre-commissioning training to graduated training in its optimisation, commensurate with service profile and assigned roles. Further, it would mandate the inclusion of specialists as trainers (amendment of professional education) and, most importantly, integrate the role these technologies play in operational discussions and wargames.
- The training infrastructure and tools need to be enabled by technologies for virtual training besides enhancing classroom training. Instructional computer-based training packages, simulators – both technical and tactical – and military apps for mobiles, can supplement current classroom instruction and be used as study aids or refreshers for soldiers in operational units.
- Last but not least, the senior leadership must be brought abreast with technology infusion and payoffs, to derive confidence and bridge the technology-aversion gap. Technology capsules by specialists aimed at functionalities and application in combat must find focus both in the Field Army and training institutions.

RECOMMENDATIONS

The Indian Army needs ‘techno warriors’ who have a blend of a sharp mind, are empowered with modern-day technology, and are fully-trained in multi-domain military skills. **The need is thus for a leadership adaptive to emergent technology, which is knowledge-based, decision-oriented and optimises**

joint force capability. The summary of recommendations at the Strategic cum operational level and tactical level for integrated technology and techno military leadership development is as under.

Strategic and Operational level

- **Carry out a doctrinal review of deterrence and operational philosophy based on deterrence by denial and a capability-building approach for technology induction and leadership development.** We need to relook at our strategy. Do we require a strategy of defence or denial or domination? Each requires a different capability-building approach, supporting technologies, and a politico-military escalation control matrix. Deterrents particularly need to be evolved for Beijing's lesser forays – the incremental nibbling that remains below the threshold of violent retaliation – that can prove even more devastating, and far more difficult to counter. We need to target PLA's vulnerability rather than just countering its strength. The world continues to target China's strengths, whereas China continues to target their vulnerabilities. For too long have we seen Chinese intent from a myopic Indian lens. We need to understand the Chinese intent from the Chinaman's mindset and long-term vision. The doctrinal void of a National Security Strategy and National Defence University remains glaring.
- **Adopt a systems approach to technology induction** through identification based on theatre-specific desired capability as an outcome of defined operational philosophy; match the availability to identify the voids and then invest in a scaled manner to prioritise, based on value, vulnerability, and risks in temporal terms.

- **Upgrade Technology Infusion at Training Institutions and technology capsules at the Field Army level to empower Techno Military leaders.** Distributed Learning and non-resident courses with short contact programs need to be institutionalised and given due credit. The technology generation gap between strategic and operational military leaders must be bridged for the rise of a techno-military culture in all operational discussions and exercises with troops.
- **Review recruitment, retention and employment of specialists,** both non-uniformed (eg. induction in TA) and uniformed, for optimal exploitation and upkeep of technology. A few areas such as Information Warfare require civilianisation and a civil-military fusion.
- At the theatre and operational level, the requirement is for leaders to **imbibe a scientific temper and thought leadership** for the furtherance of war plans and contribute to active or passive peace. We cannot remain trapped in past paradigms nor rest in the self-generated idealisms of the future. Tactical leaders must invest more in the creative and bold employment of theatre-specific technology for combat effectiveness.
- **Adopt a tri-service approach to both technology induction and HR empowerment,** eg., UAVs, C5ISR systems, etc., and integrate training needs for better inter workability.
- **At the strategic politico-military level, invest much more in R&D and HR funding,** with a focused operational approach and a long-term perspective. The gap is wide and getting wider. This is a challenge, given the sparse availability of resources, but outcomes will be directly proportional to this strategic investment.

Future Battlespace: Embracing Change in the Future of Warfighting

- **Review force structuring and application**, matched with complementary sector-specific technology for optimal effects and smart warfighting in the battle space. For example, Integrated Battle Group (IBG) equipping, training and technology empowerment, must be viewed as one entity, not an arm or service-specific requirement.

At the Tactical Warfighting level

- **Increase the tempo, agility and velocity of combined arms forces.** Structure, organise, equip, train and manoeuvre as a combined arms force at the lowest practical level – IBG is the way forward. A one-size-fits-all solution IBG equipping, training and technology empowerment does not work.
- **Manoeuvre by land, air and sea at the operational and tactical levels** – 2D to 3D force application in a surface-to-space continuum, both in the kinetic and non-kinetic domain. Target both the capability and will of the adversary, which are, anyway, complementary.
- **Establish an “unblinking eye” over the battlefield, supported by real-time communication with redundancy** – C5ISR (command, control, computers, communications, combat systems, intelligence, surveillance and reconnaissance) is the starting point.
- **Proliferate precision and distribute it downward** – the lowest tactical level should be given the same relative advantage in precision firepower.
- **Supplement manned with unmanned reconnaissance and kinetic with non-kinetic** – proliferate from the operational level to the tactical level.

- **Encourage a culture of joint force application and discourage silos or parochial mindsets** – Integrated Command and Control, and shared technologies.
- **Theatre-integrated and responsive logistics backed by adequate war stamina** and technology-aided means will need to be planned. Intended ‘short wars’ are no longer so short.

CONCLUSIONS

The imperative is to dispassionately acknowledge “where we are and where we want to be”, to prevail against future security challenges. The present system remains deeply embedded, and has not adapted and evolved with transformations over time. The challenges of the military technology revolution are multi-fold and dynamic. The extensive use of AI, robotics, advanced sensors, mixed reality, wearable technology, the Internet of Things (IoT), and Quantum Computing, have created an Internet of Battlefield Things, and the ongoing information revolution is bringing major disruptions in military affairs. *Technology manifestation requires demonstrative commitment in terms of funding, joint structures, doctrinal review, HR management, revitalised PME and, above all, a change in legacy mindsets and culture.*

Yet, technology is never going to replace humans in warfare. The human that recognises the technological potential and exercises an optimal blend of the art and science of warfare will emerge victorious, beyond just hardware. Technology also requires a “whole of nation approach” with a strategic vision, understanding of the future challenges, and time-critical outcomes with accountability, beyond myopic domestic politics or bold statements, which leave capabilities at a sub-par level.

SOUTH ASIA INTELLIGENCE REVIEW

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