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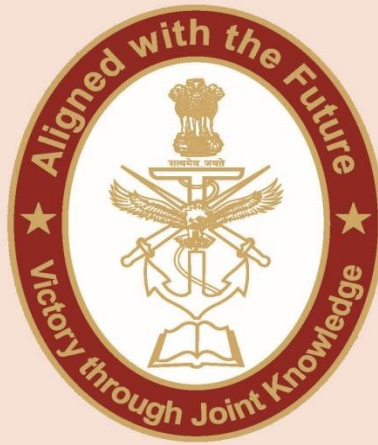
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DISRUPTIVE TECHNOLOGY: NEEDS A DE-NOVO OUTLOOK FOR ADOPTION IN THE INDIAN DEFENCE FORCES

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War and Technology Strategic Construct

War is unpredictable and is continuously evolving. However, war has an enduring and eternal nature and an evolving dynamic character. Since nature is unchanging, force and violence will not disappear but will manifest in newer forms by technological advancements in the character of war and conduct of warfare.The pace at which these technologieshave transformed the modern battlefield has shifted the focus away from how armies fight to what they fight with, and from occupation to domination. The ever fragile balance of power, the rapidity at which military technologies are developed and employed, and the dynamic geopoliticalenvironment present continually evolving threats to nations and militaries in particular. This has created a newfound fragility in the nation's security domain driven by globalization leading to diffusion to non-state actors, commercial interest and dual-use technologydriving military technology and austerity in budgets demanding nontraditional cost-effective solutions driven by technology.Understanding the value, potential and employment of disruptive technologies can thus determine the strategic outcome of military competition.The challenge remains an optimal amalgam of technology, strategy and the human element.

Future Battlespace and Technology Interface

The threats faced by nationsthus suggests that military preparedness alone is not enough. Understanding and anticipating evolving threats and disruptive technologies should be at the forefront of military strategic planning and threat assessments.The evolved complexity of wars renders states vulnerable because the military techniques employed are designed to weaken societies' social and political cohesion and rarely lead to a military resolution. On the other hand, states still possess tanks, traditional weapons and fighter aircraft, naval fleets etc, meaning that traditional armed clashes still pose a threat, as the current Nagorno and Karabakh conflict and the Chinese Ladakh 2020 misadventureover disputed territory exemplifies. In the Indian context,the military threat posed by China and Pakistan in the form of inter-statestrategic competition will prevail in the future, albeit in a multidimensional technology-driven domain of the larger canvas of security like the recently witnessed drone attack on the Jammu airfield and the all-pervasive Chinese cyber-attacks.

Possibly the most disruptive changes have been driven by the emergent technology and revolution in military affairs, signaling the rise of a military-techno culture in which time, space, force, information and other fundamental conditions are radically changed.The future technology shaped battlespace will be characterised by the following:-

- 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. Leaders and warfighters will not remain isolated from its fallout and thus must be trained to function and work through chaos.
- There would be an ascent in the levels of volatility and uncertainty with information overload and ambiguity. Clarity of thought and focus, along with the ability to make decisions in such situations while distinguishing between risk and danger will be a critical ability.
- Lower predictability and enhanced diversity will require a shared view of the goals and a more collaborative politico-military technology interface.

- Diffusion in technology will not only make it affordable and accessible but difficult to distinguish foe from friend. Technology in the hands of a terrorist is no more a fallacy.
- Knowledge and the ability to envision will be the most valuable asset. Knowledge-based, mil-political interfaced, decision-oriented and optimized joint force capability will no more be a luxury but a necessity.

Reality Check: Technology Adaption

Technology has its underpinnings and dynamics which need to be understood and addressed to optimize capabilities in future wars. These are as follows:-

- When a new technology first appears, the leadership has no idea what to do with it which leads to confusion and a response. 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 than exploited. Although technology is making great advances, human beings will remain the most effective systems for determining its relevance.
- Technology without integration, or a conceptual underpinning, is the hype before the let-down. Sun Tzu warned, "tactics without strategy is the noise before defeat." Technological superiority does not guarantee military success, it will act as an enabler, yet not the problem solver always. The conduct of war requires both science and art. Good leadership, quality soldiers, cohesive units and streamlined organization, are necessary. Artificially intelligent, autonomous machines are likely to be among the greatest military integration challenges due to the additional complexities it creates for network architectures.
- Technology compels integration &jointmanship. Training and equipping of forces become a key aspect when we are trying to integrate technology for optimising joint force capabilities. Technology is just a tool and an enabler. It is the status quo culture and individual service mindset that retards its exploitation.

- Quantity has its own quality and thus boots & tracks on the ground count. This is true particularly when nations have disputed borders like us. Also, disruptive technology has not replaced low-technology in land warfare. It has supplanted it. Every technology is a transition and has limits.
- Finally, technology induction is a factor of forecasting, identifying and budgeting future disruptive technologies to develop timelines, methodologies, structures and strategies for adoption.

Disruptive Technology and its Influence on Warfare

Decoding Disruptive Technology. The technologyaimsto change the status quo and facilitate efficient outcomes, whether in business, warfare, or any other societal endeavour. Under this standard, all new technologies could be considered disruptive" However some technology could be evolutionary asa spiral upgrade of existing technology and thus classified as an evolutionarytechnology.Disruptive technology does the opposite, it is revolutionary in the inception and changes the existing paradigm in the application. However, it comes withattendant challenges, vulnerabilities and risks, being untested. Hence the innovator's dilemma.Disruptive technology thus radically creates an asymmetry between adversarieswhich then mandates revision of the policies, doctrines and organization.Technology induction is impacted by the two key factors of innovation and disruption. Both innovation and disruption influence the status quo, though impact differently. Disruption causes systemic changes as it displaces or disrupts an existing technologysignificantly,while innovation is a rational process that upgrades or adds value to products and techniques.

How does it Influence Warfare? Understanding the value and potential of disruptive technologies can determine the strategic outcome of military competition. A disruptive technology may be an enabler, catalyst, enhancer or a breakthrough in its influence on warfare. The disruptive influence of technology can be characterized by the following:-

- Delivers a capability at a previously unavailable level, which may create disruptive forces and transform structures for a military edgein geometrical proportion;

- Compliment other technologies to create synergies, which may also be cumulatively disruptive;
- Requires users to significantly change their behaviourin terms of doctrines, tactics and leadership adaption to take advantage of it;
- Changes the prevailingwarfare and technology paradigms to another, changing the way of operation and therefore, the way things are done.

Technologies Causing Disruption

Autonomous defence systems, cyber warfare, robotics, big data analysis, blockchain technology and Unmanned Aerial Vehicles/Drones have already begun to impact warfighting strategies. Directed Energy Weapons, Nano Technology, Quantum Computing, Additive Manufacturing, Big Data Analysis, the Internet of Things and Artificial Intelligence cum Cognitive Computing once operationalised will have a transformational impact on the planning and conduct of warfare and will revolutionise traditional notions of force projection and force application. The impact of technology on the future battlespace will thus enlarge its canvas and depth with long-range lethal and precision capabilities beyond visual ranges with added deniability and greater intensity.The key priority technologies relevant to the Indian operationalcontext that merit deeper analysis are:-

- Detection / Low-cost overhead persistent sensing technologies as part of the C5ISR capability building.
- High-energy lasers for military application through land, air, sea and space-based system.
- Hypersonic strike technology.
- Artificial intelligence (AI) and big data analytics.
- Advanced cyber capabilities.
- Robotics and Unmanned Systems including countermeasures.

Structural and Doctrinal Transformation and Adaption

India has set an ambitious target of growing into a $1 trillion digital economy by 2025 which will be propelled by a technology-driven industry. India has the second-largest data and AI talent pool after the US, besides some of the top technology brains both within and outside the country. This lays a foundational construct to collaborate in dual-use homegrown technologies for the defence sector too. However, the key to this will be an*institutionalised structure and a sound technology induction strat*egy. These could pave the way for a pragmatic road map for induction, adaption and optimisation of technology in defence.

While the TPCR (Technology Perspective Capability Roadmap) exists yet it lacks the teeth being focussed essentially on up-gradation of existing technologies. The need is to identify and encourage future homegrown disruptive technologies over the next decade or so, budget them, establish PMO (Project Management Teams with holistic staffing) and periodically review under anApex monitoring mechanism, with the due delegation of powers and decentralised decision making. DRDO remains caught up in the development of more traditional forms of technology facing challenges of delays, underbudgeting, low motivation talent, and superannuated technology. While the Indian programmes of missile and space have seen considerable development, a paradigm shift is required to proactively respond to the challenges being posed by new and emerging disruptive technologies through a more collaborative PPP model based on the indigenous character of Atmanirbhar Bharat.

The challenge to the Indian Armed Forces is not only to adapt technologies into military systems to gain a competitive edge or address a present vulnerability but also to bring into linea supporting acquisition system, budgeting and manufacturing base. Technology will remain as relevant as its adaptive leadership, structures and doctrines. However, there exists a significant gap between technologists, policymakers, strategists and warfighters due to compartmentalised functioning. The importance of bridging this technology and the human domain is increasing; the challenge remains organisational, strategic, and cultural lethargy and status quo mindsets. The luxury of distinctive pursuits in the compartmentalised military and political arenas or individual service silos does not exist in contemporary battlefields and more so in a technological shaped

operational environment. The need is to understand the importance of each of the emerging technologies and optimize their military application through a dynamic interplay between all stakeholders.

The technology evolution cycle for these technologies is much faster than traditional military adaption programmes. The greatest challenge remains fiscal support and investment in R&D to science and disruptive technology projects, in the long run,even though their percentage manifestation rates may be low and time-consuming. This mismatch could create a criticality especially against our Northern adversary China who is a generation ahead already in this sphere. Thus besides exploiting the potential of DRDO, C-DAC, IDEX and the Army Design Bureau; a Disruptive Technology Commission (DTC) with Defence as a subset under an overall National Technology Task Force (NTTF) should be set up under the National Security Adviser, to forecast, assess, encourage R&D projects andnurture emerging Disruptive Technologiesbased on DTC recommendations.

The strategic focus must be to bridge technology gaps and shorten acquisition timelines with induction of modern in-service technologies earliest, by way of product improvements in the short term. Simultaneously develop R & D for state of art technologies for future time-critical technology infusion in the midterm. In the long term invest in Science and Technology projects for generation after the next disruptive technologies in the long term. This spiral and progressive approach based on indigenous solutions need to be institutionalized. The imperative is to encourage indigenous solutions and integrate mature technologies with incremental improvements while investing in future disruptive technologies. This would be a holistic approach to technology induction.

The million-dollar question remains, Does 'doctrine drive technology' or does 'technology drive doctrine'? For the advanced industrial and technological base, many examples of 'doctrine driving technology' can be found like the USA and China. Yet for nations with nascent defence industrial base like India, it could well be 'doctrine adapting to evolving technology. Thus, the imperative remains developing appropriate concepts of operation, making the organizational changes, and creating the doctrine and practices that fully exploit the available technologies.

Conclusion

The challenges of disruptive military technology are multifront. The extensive use of robotics, advanced sensors, augmented reality, wearable technology, the Internet of Things (IoT) becoming the Internet of Battlefield Things, and the ongoing information revolution is bringing in a new revolution. Technology manifestation requires demonstrative commitment in terms of funding, structures, institutional collaborative framework and above all change in present mindsets and culture. While the Indian Defence Forces are donning a path of restructuring, modernisation and doctrinal review, disruptive technology must not be given a step-motherly treatment.

CERTIFICATE

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