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Artificial Intelligence in Military: Evolving Battlespace and Warfighting of 21st Century

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"Whoever becomes the leader in Artificial Intelligence will become the ruler of the world".[1]

—Vladimir Putin, 2017

Introduction: Artificial Intelligence in Military

Rapid advancements in technology have brought mankind to a crucial threshold in its relationship with war and the recent applications of Artificial Intelligence (AI) in military is transforming both the battlefield and warfighting. After the invention of Gun Powder by Chinese in 9th Century, AI is being considered transformative and revolutionary as part of the ongoing so called Fourth Industrial

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Key Points

- AI is being considered transformative and revolutionary as part of the ongoing Fourth Industrial Revolution.
- Weaponisation of AI for strategic advantage in space, cyberspace, air, land and maritime domain is likely to accelerate the kill chain.
- Spectrum of autonomy in AI while developing various weapon systems ranges from automatic, automated to autonomous.
- Stuxnet, the cyber shot heard round the world, could be termed in true sense 'the first cyber or digital weapon'.
- New technological battlespace underpinned by AI is Expanded, Converged and Compressed.
- Multi-Domain Battle Concept can be operationalised with three inter-related components namely calibrated force posture, employing resilient formations and convergence.

Revolution.[2] AI Revolution is now enabling the *cognitisation* of machines, creating machines that are smarter and faster than humans. One of the US Army wargame in 2019 concluded that an infantry platoon, reinforced by AI-enabled capabilities, can increase its offensive combat power by a factor of ten, thus significantly tipping the defensive-offensive balance in the attacker's favour.[3]

Weaponisation of Artificial Intelligence

Many military applications of AI are uncontroversial like improved logistics, cyber defense, robots for medical evacuation, resupply, or surveillance. However, weaponisation of Artificial Intelligence for strategic advantage in space, cyberspace, air, land and maritime domain is likely to accelerate the kill chain while simultaneously increasing the force survivability in both offensive and defensive operations. Consequently, military strategists who envision 21st century warfighting will have to rethink and fundamentally evolve both battlespace and warfighting techniques underpinned by their AI capabilities.

Nature of war is constant however, its character is ever evolving.[4] If militaries cease to refine, expand, and improve; they risk becoming outdated, stagnant, and defeated. Therefore, it is pertinent to evolve a comprehensive understanding of AI in military and evolve warfighting techniques with strategic, operational and tactical implications. In this perspective, the aim of the paper is to analyse the impact of AI Revolution in military and its manifestation in the evolving battlespace and warfighting techniques of 21st century.

AI Revolution in Military: Brief Insight

"The Potential Benefits of Artificial Intelligence Are Huge, So Are the Dangers".

—Dave Waters

AI revolution. No one planned on an AI Revolution especially in the military domain. Taking cue and with 'Democratisation of Artificial Intelligence Technologies'[5] (being dual use, commonly available), on 11 January 2018, the world woke up to the news of Syrian rebels launching 'Mass Drone Attacks'[6] against a Russian Airbase. Russians managed to take out all thirteen drones but it was an ominous harbinger of widely proliferated AI technology.

The 14 September 2019 drone attacks on Saudi ARAMCO oil facilities at Abqaiq and Al Khurai by Houthi rebels reinforced the fact that the world militaries are moving towards an 'Era of Technological Equivalence'[7] (availability of cutting edge technologies between the warring parties). Similarly, on 08 January 2020, Iranians beat American Patriot and French Crotale and Skyguard at telling accuracy and with strike rate of 95 percent employing 18

drones and seven cruise missiles - a new kind of precision air power at fractional cost. This AI Revolution in warfighting is ongoing.

Three dimensions of autonomy in AI. The Spectrum of autonomy in AI while developing various weapon systems ranges from automatic, automated to autonomous is best explained in the figure with autonomous weapon systems being all encompassing.[8] Further, these dimensions can be best illustrated by comparing the functioning of HARPY Drone and HARM (High Speed Anti-Radiation Missile). Israeli HARPY (Autonomous) stays aloft, identifies its target and allows human interface before final targeting. However, HARM does not permit this human interface before targeting (Automated).[9]

Figure 1: Three Dimensions of AI in Weapon Systems
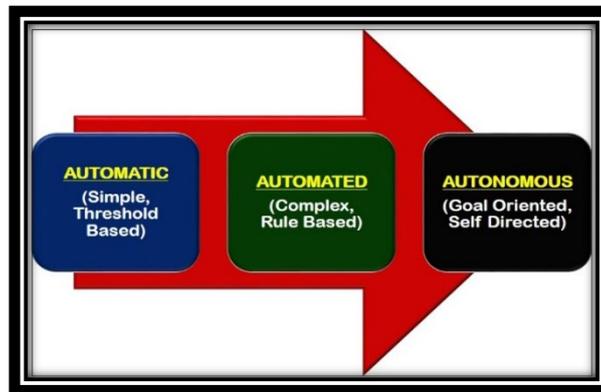
Source: Annotated by Author

Global AI race, terminator conundrum and flash wars. Leading science and technology luminaries like Stephen Hawking, Elon Musk, and Bill Gates have spoken out against the AI assisted autonomous weapon systems warning that they could spark a 'Global AI Race'[10]. 10th US Vice Chairman of the Joint Chief of Staff General Paul Selva has interestingly termed this AI Race 'The Terminator Conundrum'[11] (AI leading to catastrophic disaster). Strategic thinkers fear that like stock trading leading to 'Flash Crashes' on Wall Street, could autonomous weapons powered by AI lead to 'Flash Wars' (sudden unplanned offensive)? Jean Baudrillard (French Sociologist) had famously said, "The sad thing about Artificial Intelligence is that it lacks artifice and therefore, intelligence"[12] emphasising his concern about AI in military.

Invisible war. Cyberspace supported by AI has also evolved as the new, revolutionary and invisible domain of warfare in 21st century. In first widely recognised 'Cyber War', Estonia was besieged with 128 DDoS attacks by Russia. Stuxnet, the cyber shot heard round the

world[13], could do more than spy, steal things, and delete data. Stuxnet could be termed in true sense 'the first cyber or digital weapon'.[14]

Nature of War and Its Evolving Character Underpinned by AI

"While the nature of war is constant, the character keeps evolving and changing". [15]

—**Carl Von Clausewitz in** *"On War"*

Nature and evolving character of war in the era of AI. Transformative AI is enabling combat systems / structures to think and act faster than thought. How do militaries look at this disruptive phenomenon triggered by AI? Will the cumulative impact be so transformational so as to fundamentally change the character of physical fight? The AI generation of military strategists should not find themselves preparing for the last war, but quite often for the wrong war. This is the simple truth of history: 'warfare evolves faster than the war fighters do'.[16]

Traditional Clausewitzian beliefs predicated on hardcore kinetics and perseverance in the use of force are being questioned to the accompaniment of China's rise. Sun Tzu's tenets such as winning without fighting, deception, victory without bloodshed, deceit and superiority of knowledge have started to gain prominence.[17] This Chinese way of fighting has given lease of life to the concept of Grey Zone or Non-Contact Warfare. In this type of warfare, 'binary approach to conflict is shed; wherein one is either at war or peace; either lose or win'.[18] Accordingly, combat is no longer confined to the physical domain—it is as much a feature of the informational and cognitive domains. Similarly, technology is also tipping the doctrinal cycles.[19]Hence, it is of paramount importance that military strategists understand the evolving character of war underpinned by AI else they are destined for militarily irrelevance and surfeit defeat.

Technological Battlespace: Era of 'I' (Information-led) Combat

"Fighting the Fight That Fits One's Weapons and Making the Weapons to Fit the Fight". [20]

—**Unrestricted Warfare**

Highlighting the importance of the evolving character of war in the era of 'I' Combat and the emerging technological battlespace, General James Mattis of US Marine Corps urged traditional militaries to introspect seriously. Militaries of 21st century need to introspect in order to ensure that "*They are not dominant and irrelevant at the same time: dominant in a form of warfare and technologies that are no longer relevant*".[21] In fact, similar and related

sentiments contextual to this evolving battlespace have been expressed by two Chinese Senior Colonels Qiao Liang and Wang Xiangsui in February 1999 in their book 'Unrestricted Warfare'.

Merger of old and emergence of new domains in warfare. Land, sea and air domains of war have near merged and space and cyber have emerged as fourth and fifth domain. Today, technological leadership need not necessarily be demonstrated through live combat and wars. China has created an aura of being the undisputed military leader in key AI related military technologies with a deterrence logic of its own. In fact, these revolutionary technologies are tipping the doctrinal cycles, first time in the history of warfare.

New battlespace: expanded, converged and compressed. Older operational frameworks led military commanders to visualise the battlespace compartmentalised in time, over geographic space, and by function or domain. However, this new and evolving technological battlespace allows them to visualise the posture and convergence of capabilities across domains, environments, and various functions required to manoeuvre. New technological battlespace is Expanded, Converged and Compress [22] .Battlespace has expanded geographically because of the effects of space, cyberspace, electronic warfare (EW), information, and even conventional weapons with increasing ranges. It is no more bounded by geographic and time constraints. It is also expanded by increase in the number of actors, use of proxies and surrogates, and conflicts becoming trans-regional. The ability to integrate capabilities across many domains, environments, and functions in time to achieve effects at any geographic location have converged the battlespace. Ability of strong militaries to both expand the battlespace and converge their capabilities has compressed the strategic, operational, and tactical levels of war. This strategic-to-tactical compression is a result of the extended sets of conventional, information warfare, and unconventional capabilities attained through the AI Revolution.[23] This compression is likely to shorten the decision cycle during combat.

Figure 2: New Battlespace— Expanded, Converged and Compressed
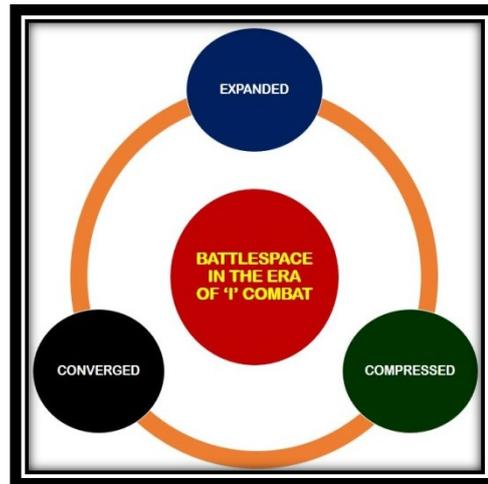
Source: Annotated by Author

Era of contested equality: 'I' Combat. This newly evolved technological battlespace has led the world entering into the 'era of contested equality' wherein technology will make unequals, equal.[24] Perhaps this is already happening: the battle winning factor in the future combats may not be the numerical equivalence but technological superiority and enable militaries to embark on the path of 'I' Combat (Information led combat whose sole mission is to take the algorithm warfare to such a high so as to win the AI arms race conclusively). Project MAVEN of US Army is tipped to be a sub-set of 'I' Combat[25] in future.

World War 'R' (ROBOTS). This AI revolution is neither American-made nor American-led. Countries around the world are pushing the envelope of AI in military, many further and faster than the United States. Drones and other AI supported military hardware and software have spread to nearly a hundred countries around the globe, as well as non-state groups such as Hamas, Hezbollah, ISIS, and Yemeni Houthi rebels. South Korea has deployed a robot sentry gun on its border with North Korea. Israel has sent Guardium, an armed robotic ground vehicle, on patrol near the Gaza border. Some other examples include UK Brimstone Missile, TARANIS Drone (by BAE Systems), URAN-9 (Russian autonomous APC), Russia's VIKHR Robot Tank etc., are some revolutionary examples in this direction. Russia reportedly also has plans to develop a fully robotic version of its next-generation T-14 Armata tank. T-14 will be the first main battle tank to sport an uninhabited turret. Making the entire tank uninhabited would be the next logical step in protection, enabling a crew to control the vehicle remotely.

In an article on the future of warfare in 2013, Russian military Chief of Staff General Valery Gerasimov wrote: "While today we have flying drones, tomorrow's battlefields will be filled

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with walking, crawling, jumping, and flying robots. In the near future, it is possible a fully robotized unit will be created, capable of independently conducting military operations."[26] How shall the world fight this World War 'R' (Robots)? What form and means should be employed to defeat this robotised enemy?

Warfighting Techniques: Multi-domain Battles and Centaur Warfighter

"The Challenge is to Identify and Adopt a Concept of War Fighting Consistent with Our Understanding of Nature of War and the Evolving Character of Modern Battlefield".[27]

—US Field Manual

From above pointers, it is quite clear that the warfare is evolving rapidly, and operating environment is becoming more contested, lethal, and complex; beyond anything world has seen in the past. Addressing these challenges demands a threat-based analytical approach. The recent evolution of Combined Arms in US Army describes how ground forces, as part of the Joint Force will operate, fight, and campaign successfully. However, looking into the future battlespace operated through AI and contested in all domains; warfighting techniques will have to develop and exploit battlefield opportunities across a much larger operational framework and would include 'Whole-of-Government Approach'.

Multi-Domain Battle (MDB) concept— US Army.[28] To meet these challenges, US Army has recently evolved Multi-Domain Battle Concept which is an operational concept with strategic and tactical implications. MDB concept gives a glimpse into future warfighting. It is a judicious mix of all the five domains of warfare namely land, air, sea, cyber, space; and is aimed to be executed with new technologies like robots, drones and AI. It extends the battlespace to strategic arena for both friendly and enemy forces and expands the targeting landscape based on the extended ranges and lethality. Ground forces operationalise Multi-Domain Battle concept with three inter-related components namely calibrated force posture, employing resilient formations and convergence.[29]

Figure 3: Three Inter-Related Components of Multi Domain Battle Concept
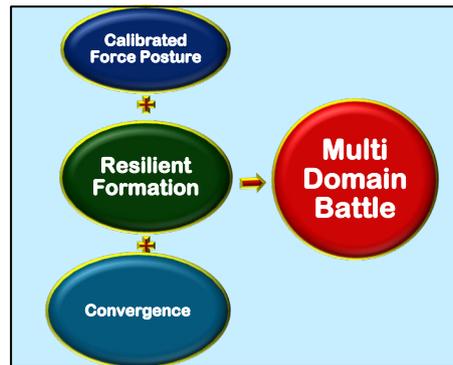
Source: Annotated by Author

This warfighting technique demands employing resilient formations that can operate semi-independently in the expanded operational arena while projecting power into or accessing all domains, and converging capabilities to create 'windows of advantage'.

(a)   **Calibrated force posture.** While calibrating force posture by itself is not a new idea, the cost of penetrating prepared enemy defenses is now too great for current conceptions of forward positioning and expeditionary manoeuvre. The Joint Force now requires dynamic force posture to compete by creating dilemmas and rapidly exploiting any vulnerabilities rather than reacting to adversary actions.

(b)   **Employing resilient formations.** Resilient formations envisioned in this concept remain effective despite multiple forms of enemy threat and are cross-domain capable. These formations must be capable of manoeuvring semi-independently, without secured flanks, cross-domain capable, projecting and accessing power in all domains in order to present the enemy with multiple dilemmas. In such an operating environment, these resilient formations would have to conduct operations employing the mission command philosophy.

(c)   **Convergence.** Converging capabilities is a new idea introduced in Multi-Domain Battle as an evolution of Combined Arms. Convergence is the act of applying a combination of capabilities (lethal and non-lethal, whether within a domain or cross-domain) in time and space for a single purpose.[30] Friendly forces achieve victory through convergence by employing multiple combinations of cross-domain operations that create physical, virtual, and cognitive windows of advantage.

Centaur warfighter and strategic corporal. AI may be the 'last invention' not because it will solve all our problems but because it may lead to our extermination.[31] Stephen Hawking

once warned 'development of full AI could spell the end of human race' and Elon Musk described the creation of human level AI as 'summoning the demon'.[32] Their concerns, though fanciful sounding, are rooted in something called 'Intelligence Explosion' and could also be termed as 'unshackling of Frankenstein's Monster'[33] both pointing to doomsday scenario. Autonomous weapons also raise the concern about accountability gap. In such operating scenarios, potential of false alarm, miscalculations or accidents to precipitate conflict are huge and could trigger an Accidental War. All these scenarios are possible due to rigid rule following by these machines and their non-understanding of the context for or consequences of their actions. Hence, the best decision making system would be the one that leverages the advantages of both human and machine. Hybrid human-machine cognitive systems, often called 'Centaur Warfighters', after the classic Greek myth of the half-human, half-horse creature; can leverage the precision and reliability of automation without sacrificing the robustness and flexibility of human intelligence.

In recent years, the US military begun to worry about the problem of something they call 'Strategic Corporal in Three Block War'.[34] The basic idea is that a relatively low-ranking individual could, through his or her actions on the battlefield, have strategic effects that determine the course of the war. The solution to this problem is to better educate junior leaders on the strategic consequences of their actions in order to improve their decision-making, rather than giving them a strict set of rules to follow. Autonomous weapons would do precisely what they are told, regardless of how dumb or ill-conceived the orders appear in the moment. Their rigidity might seem appealing from a command-and-control standpoint, but the result would be the strategic corporal problem on steroids. Hence, it is crucial to evolve an effective and workable model for human-machine interface. One must remember that the benefit of 'centaur' human-machine teaming is that we do not need to give up the benefits of human judgment to get the advantages of automation. Role of human in this autonomous kill chain is both as moral agent and fail safe.[35] US Army Counter-Rocket, Artillery, and Mortar (C-RAM) system designed to protect US bases is an example of this approach. C-RAM automates much of the engagement, resulting in greater precision and accuracy, but still keeps a human in the loop. Thus, the C-RAM has a dual-safety mechanism, with both human and automated safeties.[36]

Way Ahead: Recommended adaptations for the Indian Army

"India Needs to Prepare for the War of Future Rather Than Just for Tomorrow".[37]

—General M M Naravane, COAS, Indian Army

Indian Army (IA) has carefully analysed the changing character of warfighting within the overall framework of conflict as relevant to the Indian context in 21st century. In fact, the Joint Doctrine of Indian Armed Forces (JDIAF) 2017 has rightly stated that Services fight as an integrated and cohesive force. However, the focus on cyber and space domains is still lacking. September 2019, while addressing at CLAWS on 'Nature of Future Wars and the IA', General Bipin Rawat stated that the besides the conventional domain, Grey Zone and its varied nuances are receiving requisite attention. IA needs to focus on 'Dynamic Response'- actions below the threshold of all-out war and developing both kinetic and non-kinetic responses. While speaking to *'The Print'* in January 2020, on taking over the reins of IA, General MM Naravane also echoed similar sentiments.

IA is also in the process of IBG-isation as one of the response to this changing character of war and guide its operations as part of the above stated 'Dynamic Response'. Creation of these lean, agile and tailor made structures is a right step to achieve operational objectives. IA could pick up number of best practises from the organisation and equipping of the Resilient Formations being raised as part of US MDB Concept. It needs to embrace the low-hanging technology to leverage emerging disruptive domains. As a start point, it has initiated itself into AI with activities like predictive maintenance of its tank fleet, Mandarin translation, ISR analytics, medical diagnostics and analytics in cyber domain. Centre for AI Excellence has been set up at MCTE, Mhow. As part of medium term goals, it could also look at tapping blockchain technologies, lasers and Directed Energy Weapons (DEWs) for possible military use. It is also worth noting that India has recently created cyber, space and special forces agencies but no such organisation at tri-service level has been created in the domain of AI so far. As part of long term measures, Indian armed forces should plan to equip themselves with AI assisted A and B vehicles, drones and counter drone equipment. In this evolving technological environment and as part of long term action plan, it is important to evolve a strategy with regard to the man behind the machine on the lines of Centaur Warfighter and training him to be a Strategic Corporal in the battlefield. Indian defence forces need to create a central structure for AI with a right mix of three services, DRDO, civilian agencies including participation from private IT companies. To shape the battlespace of tomorrow based on shifting paradigms of warfighting in 21st century, Indian defence forces needs to fortify its traditional capacities and build new capabilities in these emerging domains.

Conclusion

AI is sweeping across this evolving battlespace and warfighting techniques landscape and is on the verge of tipping the doctrinal cycle for the first time in the history of warfare. Militaries which are building and employing AI technologies will have tremendous power to set the terms of how they could be employed militarily. Decisions made now in this evolving domain will have a long and lasting impact on the means and ways of warfighting in 21st century and the emergence of a new Digital World Order.

"*These military devices, leading to victory, must not be divulged beforehand".[38]*

—Sun Tzu

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