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VICTORY THROUGH VISION

Managing Editor's Note

The English author Edward Bulver-Lytton had first coined the now popular phrase "the pen is mightier than the sword". As an army man, I would disagree with that statement as that was written in a political context. However, I would agree that for a warrior the pen is just next in effectiveness to the sword. If a warrior does not have wisdom, he will not learn about war by researching and analysing it, and he will lack in the crucial battle-winning factors of an informed intellect, institutional wisdom and learning from past experiences.

Since its inception, the Scholar Warrior has tried to be that counterpart of the CLAWS journal which aims to instil the qualities of a scholar and a warrior both in its readers and writers. Continuing on that track, this issue of the Scholar Warrior has ten articles and two book reviews. Some are by those who are researching a particular subject and a few by acknowledged experts in their field. We are sanguine our readers will find all the articles interesting and educative and they will lead them on to further research into these and related national security issues.

The article 'Relevance of Mechanised Forces and Tanks in Future Battle Space' is by Lieutenant General KJ Singh (Retd) a former Army Commander in Western Command. That experience as well as the author being from the armoured corps makes him eminently qualified to write on this subject. This article carries out an objective analysis of the relevance of Armoured Fighting Vehicles (AFVs) in light of recent wars, to ascertain if in some informed circles, there has been a pre-mature sounding of the death knell of the tank.

'The Wagner Debacle: Impact on Future Warfare' is an article by the security analyst and blogger Group Captain (Dr) K Ganesh (Retd). He analyses the events of Jun 2023 in Russia, which the West called an attempted coup by the head of Wagner Private Military Contractor—rightly so because it looked like that for some time. It thereafter delves into PMCs and their impact on future warfare.

Colonel Rajnish Maahi writing on 'Counter Fire Operations: An Analysis with Future Perspective' writes that the need to achieve a Favourable Artillery Situation

(FASIT) has emerged unambiguously in the ongoing Ukraine-Russian conflict. He carries out a brief analysis of the same and gives some recommendations for future warfare.

Major General Ajeet Bajpai, a cyber security expert, writing on 'Cyber Capabilities for Indian Army as Part of Multi Domain Operations' states that operations in cyberspace offer a high degree of asymmetry in a multi-domain and interconnected battlespace. Therefore, the Indian Army needs to develop potent capabilities to defend, exploit and dominate cyberspace. He then explains as to what should be the approach towards this objective.

Dr Siddalingappa Guruprasad a former DG DRDO and expert on Technology Development, writes on 'Innovation Driven Technology Development' in the Indian context. He explains that the development of new technologies involves significant analytical skills with experimental research over a long time in which innovations play a very important role in the success of an engineering system's design and development project.

Writing on 'The Employment of Drones on India's Northern Borders', Air Marshal GS Bedi (Retd) states that drones can effectively monitor the border areas, which may be hard to access through traditional means. However, the Northern Areas do have challenges for their employment. He brings out how the unique geographical and environmental factors can be surmounted by drones specifically designed, equipped, and operated to handle the unique conditions of the region.

Mr R Chandrashekhar, a Senior Fellow at CENJOWS, with years of experience in the topmost offices in Army Headquarters, writes on 'Indigenisation Of Assault Rifles and Artillery Guns: Necessity of Good Standards for Developing Niche Products'. The article examines this issue from the inception of defence manufacturing in independent India, the various organisations involved in indigenisation, and the impediments to indigenisation. It finally comes to the present state where slowly but surely progress in this critical sphere is being made.

Dr Md. Muddassir Quamar, an Associate Professor, at the Centre for West Asian Studies, School of International Studies, JNU, New Delhi writes on 'New Developments in West Asia and Implications for India'. He states that the combustible nature of West Asia remains a threat. Hence, it becomes ever more important for India's foreign policy to take the ongoing developments in West Asia into account while devising the future course of engagements.

Writing on 'Cognitive Warfare in China's Active Defence Strategy', Brigadier (Dr) Rajeev Bhutani, a defence analyst and Senior Fellow at CENJOWS brings out that though Chinese theorists who are involved in this field state that China can win a war using cognitive warfare without waging kinetic war, but such claims are difficult to achieve with present technology. However, the intense effort of the Chinese in this field means that they will try very hard to gain the requisite technology and we need to be cognizant of this.

The final article is by a Research Fellow at CLAWS, Dr Shushant VC Parashar. He analyses 'Critical Minerals and India's Defence Sector: Addressing the Need for Resource Security'. The author writes that Critical Minerals are crucial for military and national defence. India needs to equip itself to enhance its role in the global governance of these minerals. A strategy to maintain reserves of these minerals is essential for their continued availability for our crucial defence needs.

There are two book reviews as under:

- The first is the book *Chip War: The Fight for the World's Most Critical Technology* by Chris Miller. This is reviewed by Col (Dr) Amitabh Hoskote who is a PhD in Development (Conflict & Peace Studies), and a Visiting Fellow at CLAWS.
- The second book review is by Abhilash Kolekar, a PhD Candidate at Jawaharlal Nehru University (JNU) and a Research Assistant at the Centre for Land Warfare Studies (CLAWS). He reviews the book *The Economic Weapon: The Rise of Sanctions as a Tool of Modern War* by Nicholas Mulder.

As always, we look forward to your feedback and suggestions.

Managing Editor

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The vision of the CLAWS is to develop a 'strategic culture' to bring about synergy in decision making both at national and operational levels. Since its inception, CLAWS has established itself as one of the leading 'think tanks' in the country. To achieve its vision, CLAWS conducts seminars (at Delhi and with commands), round table discussions and meetings with academia and intellectuals of strategic community both from India and abroad. CLAWS also comes out with a number of publications pertaining to national and regional security and various issues of land warfare.

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SCHOLAR WARRIOR

SECTION I

STRATEGY, CONCEPTS AND DOCTRINES

CENTRE FOR LAND WARFARE STUDIES

Relevance of Mechanised Forces and Tanks in Future Battle Space

KJ SINGH

Abstract

The wars in Nagorno-Karabakh and Ukraine where tanks have been targeted effectively by diverse weapon systems, in particular hand-held anti-tank weapons and drones, have generated intense discussions about whether tanks are obsolete in the modern hybrid war environment. This article carries out an objective analysis of the relevance of Armoured Fighting Vehicles (AFVs), to ascertain if this is a pre-mature sounding of the death knell of the tank. In doing so it looks at the development of the tank and its employment from the Yom Kippur war onwards. It will also attempt to flag possible retrofitting measures and value additions in design to make AFVs more effective in the contemporary battlefield environment. The article also maps an outline template to facilitate effective organisation, training and employment of AFVs. Lastly, it endeavours to examine issues relevant to the Indian environment and suggest the recommended way forward.

Introduction

The emergence of hybrid warfare, largely situated in an urban environment, has exposed the limited efficacy of AFVs, including tanks, in this domain. It has even prompted some experts declaring that tanks have become obsolete

like the Walkman,[1] a discarded audio device of yore. This trend has been magnified due to inordinately high tank casualties in recent conflicts like Ukraine and Nagorno-Karabakh (Azerbaijan). The success of armed drones has exposed the vulnerability of tanks against munitions in top-attack mode. The relative cost differential of tanks compared to considerably cheaper drones and even anti-tank missiles has magnified concerns. It is possible to saturate the battle space with portable anti-tank weapons. Various conflicts have witnessed the fielding of disruptive technologies in the form of anti-tank missiles, remotely delivered mines, attack helicopters armed drones and loitering munitions, which seek to challenge the conventional hierarchy and invincibility of established weapon platforms in the new paradigm of asymmetric warfare.

Tanks were designed to be utilised as a part of an integrated war fighting matrix referred to as the combined arms team or the integrated battle groups (IBGs) in a joint operations regime.

It will be pragmatic to carry out an objective analysis of the relevance of AFVs, as a pre-mature sounding of the death knell of the tank will put ongoing research and development on hold. Tanks were designed to be utilised as a part of an integrated war fighting matrix referred to as the combined arms team or the integrated battle groups (IBGs) in a joint operations regime. Combined Arms as a term is all-inclusive and incorporates combat support and logistics elements. They are certainly not stand-alone weapon platforms. Hence, it is more appropriate to use AFV, instead of tank as a term. Even, where the term 'tank' is used in this paper, it includes relevant implications to the connected AFV family.

In our context, we recently saw a large number of tanks being inducted in Ladakh and applied in the vanguard of the pre-emptive occupation of the Kailash ranges. India and her potential adversaries have a very large fleet of AFVs and have shown no inclination to discard them. We have also recently launched a project to develop a light tank, "Zorawar", in response to the fielding of a light tank, ZTQ-15 by PLA opposite us in Ladakh in the high-altitude area.[2, 3]

Development of AFVs: Futile Quest for a Silver Bullet

Quest for Silver Bullet. Armed Forces propelled by the military-industrial complex tend to look for the magical "silver bullet" to secure decisive results on the battlefield. Starting with spears and arrows, this quest for super weapons has been shaped by movement (manoeuvre), firepower and protection, as the three

key determinants for designing and development. It started with elephants, horses and chariots, progressing to mechanical locomotion, coupled with protected, armoured platforms. The Tank was described as the game-changer in its appearance on the battlefield of Somme in 1916. It has been often hyped-up in Rambo's type of imagery of being the ultimate 'Terminator' by Hollywood war movies. Tanks, combine three key elements of mobility (agility), firepower (lethality) and protection (survivability) in varying proportions, reflecting the warfighting and design philosophy of stakeholders. While the stress is to design lighter (more agile) platforms carrying a big calibre gun and missiles—with all-round protection—yet it finally turns out to be a compromise product amongst conflicting macro determinants and even within each attribute. This explains the current vulnerability against top attack due to emphasis on protecting the frontal arc, leaving the top portion of the platform relatively vulnerable.

Combined Arms and Joint Operations Concept. Over the years and driven by combat experience, the family of AFVs has grown with the spawning of newer complementary variants like infantry fighting vehicles (IFVs), reconnaissance/amphibious variants, combat support (firepower, air-defence, combat engineering and network management) platforms, duly supported by logistics carriers. The bottom line and defining paradigm for AFVs has been fighting as part of a well-integrated matrix in combined arms and joint operations template, duly supported by timely and responsive logistics. Matching mobility, complimentary firepower and shared protection have been key drivers, reflected in variants like self-propelled tracked guns, mounted Air Defence (AD) carriers, half-tracked and even high mobility wheeled vehicles. The complexity of multiple platforms has resulted in the incorporation of newer elements of battlefield management systems based on optronics, making it a fourth key ingredient. The large fleet of AFVs; Russia (12,000), USA (6,300), China (5,900), Pakistan (2,500) and India (4,300) is ample proof of the proliferation of this concept, backed by a proven combat track record albeit with some recent reverses.[4] Despite multiple lethal and long-range vectors, the AFVs have the unique capability to manoeuvre and close in with protected vectored fire-power to directly deliver shock and awe, triggering psychological dislocation.

Emergence of Challenges to AFVs

Yom-Kippur War-1973. The Sinai War of 1973 was one of the largest employment of mechanised formations after the Second World War. This war resulted in the

losses of approximately a thousand Israeli AFVs against 2,400 AFVs of the Arab forces.[5] This war witnessed the introduction of the wire-guided, first-generation, Russian Malyutka (AT-3 Sagger) missiles as a cost-effective anti-tank weapon system. It also highlighted Israeli crew proficiency, enabling them to hold off superior Russian T-62s and T-55s with their older Centurions and M-48 tanks on the Golan heights. Israelis also displayed commendable skills in retrofitting and recovery during combat to resuscitate damaged tanks, sometimes fielding 60 per cent to 70 per cent repaired AFVs in a 24-hour cycle. This was based on classifying AFVs as, firstly, M-kills (only locomotion impaired but utilized as pill-boxes); secondly, F-kill (armament non-functional but capable of movement) and very few K-kills. Even K-kills were scrounged for sourcing functional components for cannibalisation. It also highlighted the efficacy of integrated weapons as part of combined arms and joint operations including aircraft, air defence, tanks, missiles and artillery. The relative dominance of AFVs was challenged by the decisive reiteration of relatively economical anti-tank weapons in the form of anti-tank missiles, munitions and mines.

The relative dominance of AFVs was challenged by the decisive reiteration of relatively economical anti-tank weapons in the form of anti-tank missiles, munitions and mines.

Gulf Wars (1991 and 2003 to 2011). Coalition Forces, in 1991, in Gulf War-I (Operation Desert Storm) the multi-nation offensive anchored by the USA, employed as many as 3,000 tanks including 1772 Abrams (594 with heavy armour). This fleet included 180 Challengers, M-60, AMX-30 and lighter Sheridan tanks clad with aluminium.[6] Asymmetry created by multiple force multipliers like the Patriot air defence system and bypassing manoeuvre in desert terrain, rendered Iraqi defences ineffective. This manoeuvre enabled columns to advance 350 km in 97 hours. As per reliable accounts, Iraq lost 3,300 AFVs against just 31 of the Coalition Forces.[7] This war highlighted the continued relevance of integrated battle groups lead by mechanised forces, especially in open desert terrain. In stark contrast, Gulf War II in 2003, after initial success catalysed by technical asymmetry with force multipliers including AFVs, degenerated into slogging hybrid war till 2011. It underscored the limited efficacy of AFVs in counter-insurgency and urban fighting. Skillful use of anti-tank weapons contributed to negating asymmetry and the conflict degenerating into a prolonged unresolved stalemate, where multi-national forces and Americans were forced to seek a face-saving exit. Success in Gulf War I and the initial phase

Like a cat and mouse game, every new disruptive effect or weapon triggers an antidote. At best asymmetrical advantage like the current one in favour of armed drones is only temporary, till it is offset by an effective antidote.

of Gulf War II spurred debate on Revolution in Military Affairs (RMA), however it got eroded to a considerable extent in Gulf War II, particularly due to forces getting bogged into a quagmire of hybrid war.

Lebanon Conflict 2006. In this conflict, hand anti-tank weapons were successfully employed by Hezbollah against the mighty Merkava-4M tanks in 2006 in Southern Lebanon. 52 such platforms, each costing $2.5 million were hit and disabled by Kornet missiles and even basic rockets, costing just $900. This was despite Israel adopting a revolutionary concept in the Merkava, of putting the engine in front to bolster protection. Missiles and rockets made it difficult for tanks to operate in the urban milieu, where tanks lost their stand-off leverage due to restricted fields of fire. Consequently, the ill-fated 'Operation Change of Direction 11'[8] was called off mid-way due to heavy casualties. This dented the famed invincibility of the Israeli Defence Forces (IDF), particularly its signature platform, Merkava-4 M. Over reliance on Merkava proved suicidal for IDF. The lessons of this conflict were reinforced in the concurrent unresolved Gulf War II due to the similarity of terrain, weapons and tactics.

Tank and Anti-Tank. The anti-tank weapons array has seen the introduction of 'top-attack' by long-range vectors like terminally laser-guided artillery ammunition (the Russian Krasnopol and US Copperhead are examples), guided bomblets and remotely delivered mines. Attack helicopters and armed drones have boosted this capability. In turn, AFVs have sought to boost their protection by improvising Tank Urban Survival Kit (TUSK) and Built-up Area Survival Kit (BUSK). It incorporated cage-like structure based on spaced, slat and flail armour. AFVs also incorporated Explosive Reactive Armour (ERA) panels, which disrupt penetrative jets of High Explosive Anti-Tank (HEAT) attacks by missiles and munitions. Automated Active Protection Systems (APS) like ARENA, Shtora and Trophy are being incorporated to detect and degrade threats to AFVs.[9,10] It would be seen that like a cat and mouse game, every new disruptive effect or weapon triggers an antidote. At best asymmetrical advantage like the current one in favour of armed drones is only temporary, till it is offset by an effective antidote.

Performance Appraisal of AFVs in Recent Conflicts

Nagorno-Karabakh 2021. Inordinately heavy casualties suffered by Armenian tanks fuelled concerns about vulnerability of Russian tanks, particularly against Byraktar (TB-2), Turkish-supplied drones. It was reported that Armenia lost as many as 255 tanks, of which 146 (approximately 57 per cent) were completely destroyed in what is termed as K-kill. Of these 146 K-kill tanks, 83 (nearly 57 per cent) were destroyed by TB2s, operated by Azerbaijan forces. Others were partially damaged (F or M-kill) by TB2 strikes, artillery shelling and anti-tank guided missiles. It bears reiteration that most targets were located by TB2 drone surveillance. Some other Armenian tanks were destroyed by loitering munitions. The stage was set by the creation of asymmetry in the opening gambit by Azerbaijan. In the very first hour, it destroyed approximately 60 per cent of air defence and 40 per cent of the artillery of Armenia.[11] Resultant air superiority gave armed drones virtually a free run against tank columns which had bunched up and were ignoring basic tactics of dispersion, camouflage and concealment. While acknowledging the efficacy of armed drones, it is pragmatic to place on record that Armenia's air defence system was inadequate to defend its AFVs and artillery guns from Azerbaijan's airpower, including drones.

Much touted format of short, swift, decisive wars lasting 10-14 days of time span becoming the new norm is under challenge with the current manifestation of unresolved prolonged stand-offs.

Important Trends in the Ukrainian Conflict. While it may be a bit premature to draw conclusive inferences/lessons from ongoing and unresolved Ukrainian imbroglio, yet few indicative trends need to be examined. Mandatory caution is also necessitated due to the absence of impartial, objective reporting and info-war, characterised by narrative shaping. These are as follows:

- Continued relevance of conventional operations even when hybrid operations were being described as the emerging paradigm. However, sub-optimally executed conventional operations are likely to become hybrid slogging exchanges.
- Much touted format of short, swift, decisive wars lasting 10-14 days of time span becoming the new norm is under challenge with the current manifestation of unresolved prolonged stand-offs. The plan was based on unrealistic hope of capitulation by pro-Russian elements in Ukraine. More importantly, Russians grossly underestimated Ukrainian resistance and the

USA's commitment. In essence, operational planning has to be realistic, and hope alone cannot be a substitute for strategy. While Ukraine has suffered unparalleled destruction, yet Russian objectives are also unlikely to be achieved.

- Technological asymmetry and shaping operations alone cannot deliver operational objectives. For victory, it is mandatory to have boots and platforms on the ground.[12]
- Stand-off attrition in the form of long-range artillery and missile barrages have to be complemented with a physical vectored manoeuvre on the ground.
- The operation described as Special Military Operations (SMO) by Russia was planned in utmost secrecy and lacked consultative planning. In mechanised operations, instructions in the form of briefing have to be disseminated down to junior leaders.
- The objectives of the SMO were not only highly optimistic but there was a rigidity in planning by lacking any fallback options.
- The Russian offensive defied the key terrain parameter of the bogging effect of 'Rasputista' also described as General Mud or Marshal Mud.[13] The thawing snow combined with mud prevented manoeuvre.
- Russian offensive was designed along too many linear axes, widely separated and without mutual support. These long linear columns had no dispersion, providing easy bunched-up AFV targets much like Nagorno-Karabakh.
- Russian crews lacked motivation and abandoned their platforms. Even senior leadership was found wanting leading to the sacking of many senior commanders.
- Russian offensive relied too heavily on mechanised columns ignoring the seminal realty of the combined arms concept. Most notable was the lack of infantry to secure and clear areas.
- Russian offensive had inadequate logistics back-up as it was based on the hope of capitulation by Ukrainians. An apt example was the abandonment of a large number of functional T-80 tanks with gas turbine engines due to a temporary shortfall in special fuel replenishment.
- In sum, it appears that large platforms; fighter aircraft, tanks and ships didn't deliver, leading to these being described as obsolescent. In the domain of mechanised operations, drones, anti-tank missiles (Javelins) and artillery barrages emerged as effective anti-tank shields.

Objective Evaluation of High Russian Tank Losses. An objective comparative analysis of losses has to wait but indicative one reveals a few trends. As per estimates of Mossad and the Oryx blog site, Russia suffered 994 tank losses. These included 334 AFVs (approximately 34 per cent), simply abandoned.[14] It implies that AFVs were partially functional and only M or F-kills and not K-kills. This tally rises to 38 per cent if damaged ones (K-kills) are also included. In the first month of the offensive itself, 53 per cent of losses were abandoned platforms by unmotivated crews. Many platforms were first abandoned and later destroyed by Ukrainians and often by the civil populace. It would be fair to surmise that approximately 50 per cent of Russian tank losses can be ascribed to crews abandoning them, much unlike Israeli crews, who fought with partially damaged tanks and carried out amazing repairs and resuscitation during operations. In Chechnya in 1999-2000, the Russian Army lost 122 out of 146 tanks and infantry fighting vehicles due to a similar lack of motivation and ignoring basic tactics. Concurrently, it is estimated that Ukraine may have lost approximately 6,320 AFVs again due to confusion, capitulation and Russian fire assaults.[15] The continued relevance of AFVs is being reiterated by both sides seeking and fielding more platforms like Leopard and T-90s.

For India the large stretch of terrain we have across our map, in the form of desert, plains as also plateaus in high altitude, provide an ideal template for the employment of AFVs.

Specific Issues Relevant in Our Context

For India the large stretch of terrain we have across our map, in the form of desert, plains as also plateaus in high altitude, provide an ideal template for the employment of AFVs. Starting with 1947 operations, Stuart tanks were hauled across Zojila pass by intrepid crews after stripping the tanks to make them lighter and reassembling them across the formidable pass. They proved to be game changers characterising legendary *'jugaad'* (improvisation), resourcefulness and dedication of Indian crews to their platforms. In the 1965 war, Pakistan based its plan on a stratagem of fielding an otherwise hidden second armoured division, raised in secrecy and utilising the latest American, M-48 (Patton) tanks against older Indian tanks, the Centurions, Sherman's and AMX-13s. Once again, our crews devised a simple yet effective three rounds technique to create a graveyard of Patton tanks at Asal Uttar, appropriately christened as 'Patton Nagar'. While Indian crews improvised, Pakistanis fumbled with optical coincidence range

finders. In 1971 operations again and on both fronts, mechanised columns were in the vanguard duly supported by all arms. On the Eastern front, the Indian tank crew overcame boggy terrain and optimised the medium tanks, the T-55s. In the final push audacious utilisation of the amphibious PT-76 across the Meghna River and heli lift of troops, coupled with para drops, enabled the capture of Dacca.

The Indian sub-continent boasts of approximately 13,000 AFVs with PLA leading with 5,900 in collusion with 2,500 of Pakistan against 4,300 Indian ones.[16] Pakistan, Bangladesh, Myanmar and Sri Lanka have Chinese-supplied equipment. This provides China with a base for life cycle support and modernisation in India's neighbourhood. Pakistan's Heavy Industry Plant, Taxila and Ordnance Factory Wah, have a very large Chinese presence. China plays a significant role in the production and modernisation of AL Zarar and Al Khalid tanks and other Pak AFVs. Notwithstanding, disquiet and erosion of confidence in AFVs, their relevance in the Indian sub-continent is likely to endure due to large inventories and ongoing modernisation programmes. India has also made a switch from large mechanised columns aiming for deep thrusts to Integrated Battle Groups (IBGs) with shallow objectives, below the nuclear threshold.[17] PLA has recently fielded their version of the light tank, ZTQ-15, optimized for high altitude operations thereby triggering the Indian light tank programme of Zorawar. In the recent operation of pre-emptive securing of Kailash ranges, medium tanks were in the vanguard, with our skilled crews defying conventional power-to-weight ratio ceiling in quid-pro-quo (QPQ) operations. It is also important to take into account the fact that the performance of drones is degraded due to environmental challenges in high altitudes. APS has been incorporated in the modernisation programme to minimise top-attack threat. Hence, AFVs albeit modernised to combat contemporary challenges, are likely to remain relevant in our battle space.

Conclusion

AFVs are already witnessing an introspective churning, both in organisations and the design of platforms. The USA has already opted for lighter Stryker brigades. Marine Corps has de-activated tank battalions and transferred assets to the Army. UK Army has rolled back the Chieftain modernisation programme. Major shortcomings of Russian tanks have been ammunition cooking off due to their stowage in the turret and consequent damage to crew. Design weakness has also resulted in turrets getting detached and flying off. The Western design

had incorporated much safer ammunition in separate pods with blow-off panels. Russian Armata tanks have learnt from the Swedish design of turret-less tanks' by putting crew in protected armoured capsules and incorporating unmanned turrets. This design is also being refined in the US development programme — Next Generation Combat Programme and Decisive Lethality Platform. AbramX is experimenting with a much more agile tank powered by hybrid-electric diesel power plants, incorporating AI technologies besides crew in a safe pod in the hull. Indicative trends identified in recent conflicts are already being incorporated in the design philosophy of AFV development. The same are also funding resonance in organisations and training.

Tanks may lose their salience but are likely to remain an important platform, more so if applied as part of combined arms teams and in joint operations format. In sum, AFVs in general and tanks in particular have been utilised as the main platform in all major battles and have witnessed periodic improvements and design changes. The recent conflicts have thrown up interesting trends, which need to be validated as per applicability in our environment. These need to be utilised to refine our organisation, and operational philosophy and as inputs in AFV development programmers.

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The Wagner Debacle: Impact on Future Warfare

K GANESH

Abstract

In June 2023 an apparent show of dissatisfaction verging on a rebellion by the Wagner Group, a Russian Private Military Contractor (PMC), led to 24 hours of extreme disquiet in Russia. It also generated a feeling of schadenfreude in the Western world. This article analyses the events of June 2023 which the West called an attempted coup—rightly so because it looked like that for some time. It thereafter delves into PMCs and the impact on future warfare and conflict in terms of organisations and structure of national armies as well as the conduct of actions aimed to derive an advantage in inter-state conflict.

Introduction

On the night of 23/24 June 2023 Russia's late notorious mercenary leader Yevgeny Prigozhin who founded and headed the Russian PMC, called the 'Wagner Group" "staged an apparent insurrection, sending an armoured convoy towards Moscow and raising questions about Vladimir Putin's grip on power".[1] The Western media was quick to seize this as an opportunity to highlight a much-awaited coup against Russia's long-serving President Putin who has held continuous positions as president or prime minister since 1999. The 24 hours that went by must be characterised as an edge-of-the-seat ride, careening into a seeming abyss of chaos and anarchy for Putin's Russia, which till then seemed to be steadfast in its defensive lines across the three major thrusts of the counter-offensive underway

for past three weeks from Ukraine's newly NATO equipped and possibly Polish volunteered formations.[2]

In the newly annexed territories where the Russian military was staving off relentless counter-offensive attacks by Ukrainian forces, the mood was one of quiet solidarity.[3] The Western news agencies however saw this differently, including claiming a disquiet in Beijing over the events in Russia, and offering that Putin's grip over power now stood irrevocably weakened.[4] Serbian President Vucic rang a discordant European note, when he was quoted assessing that it was Putin who saved the day for Russia.[5] The Chinese Global Times warned that the Wagner revolt was not what the West made it out to be, describing the Western view as 'wishful thinking'.[6] So the voices and views of Russia from Western capitals appeared to be different from those emanating from the rest of the world. This article carries out an analysis of the supposed coup attempt with an aim to dial down these atmospherics and study the future of war and PMCs.

The Course of the War Prior to the Supposed Coup

Prior to this event in the conduct of the Ukraine war, the brunt of the Ukrainian attacks were in sector Z which is in Zaporizhzhiye. Russian official sources confirmed that defending units had pulled back to better lines of defence, a euphemism for a tactical retreat, even as they regrouped and were reinforced. For the first time since the Special Military Operation (SMO) began, one heard of crack Spetnatz teams being deployed to spot the Ukrainian armour, including the vaunted Leopard tanks. The teams then predicted areas of possible advance of the tanks and coordinated their interdiction from the air—a tactic that has been highly successful—using a mix of Lancet drones and Heliborne ATGM on board the Ka52 helicopters. It showed a new doctrine from the Kremlin of not allowing a retreat like the previous autumn at all costs.

Despite the initial reports of a flailing counter offensive which included vivid visuals of Leopards and armoured personnel carriers of French, German and other origins including American being smashed and scattered, the Ukrainians continued to keep throwing more formations and equipment at the Russian front lines. The war was clearly going badly for the Ukrainians as they, like moths drawn to a flame, hurled themselves at the Russian defence lines against which they had bleak chances of success as that line in five clear layers both fixed and mobile was stretching to nearly 20 kilometres in depth.[7]

The war was going Russia's way, and that is why Wagner PMC surprised even their best fans by staging a 'March to Moscow' at a time like this over some perceived grievances. After a successful campaign to evict Ukrainians from Bakhmut—which the Wagner Group did all by themselves—the group of mercenaries was possibly expecting bigger rewards and not talk of being made more accountable to the Russian armed forces.[8] That Wagner had grievances came up even in the midst of the Bakhmut campaign when Prigozhin complained on his Telegram channel through video as well as audio messages, of insufficient artillery support. This allegation was startling to most analysts who knew that strict rationing of artillery was there for the defending Ukrainians whereas the Russians were firing at will.

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Prigozhin had claimed prematurely that Bakhmut was taken, though the Ukrainian defenders holing out finally quit only 48 hours after this announcement. So, it was surprising when he claimed that Russian aerospace had targeted his group and called for the sacking of Russian Defence Minister Shoigu. He also demanded that General Gerasimov, the Chief of General Staff, come to the SMO zone and meet him at a place and time of his choosing for talks. There are videos showing him being met by the Deputy Defence Minister, videos of his troops driving without meeting resistance on the M4 motorway to Moscow and also congregating at Rostov on Don, where they surrounded the regional military headquarters. Suddenly the G7 were all fired up, the tantalizing prospects of Putin being unseated by an 'ally' in a 'coup d'état'. Ukrainians raising a toast to Russian defeat was not only on the websites of all major Western news outlets but also on mainstream TV channels.

Was this a debacle for the Russians or was Moscow diverting attention to create possible avenues for deniability for future covert operations in Europe? This was the question that came up. Was this a False Flag operation for Putin to tighten his control through favourable public opinion in controlling near chaos?[9] Equally, the possibility remained that the CIA had managed to rope Wagner PMC because mercenary groups by definition are 'guns for hire'. The third possibility was that this was hot air being released by the Wagner PMC head Prigozhin, who would realise that he had bitten off more than he could chew as events unfolded.

Even a mercenary group like Wagner PMC however motivated for its self-gain, still operated within the boundary of National Identity.

The Russian Damage Control

Moscow responded in a typical Putin style. First, Putin spoke to Russians. He didn't name Prigozhin or Wagner PMC. He called them patriots nonetheless. He commended their service. Then he warned that anyone going against orders was a rebel and that he had authorised his administration to treat them as per law while stating firmly that the chaos of 1917 would not be repeated.[10]

The Duma Chairman of the Committee on State Construction and Legislation, Pavel Krashennikov, offered the PMC Wagner honour and forgiveness if they laid down their arms.[11] The Russian Communist Party Leader Zyuganov issued a public statement in which he rallied behind Putin and called those who were rebelling agents of the West that wanted to destroy Russia. Overnight, Belarus President Lukashenko brokered a peace deal with Wagner PMC. The Wagner PMC head issued a voice message in which he claimed to have halted his March for Justice, 200 kilometres short of Moscow near Lipetsk as he wanted to avoid bloodshed. This was confirmed by CNN.[12]

While hair raising for close to 36 hours, the Kremlin never allowed the situation to boil over at any stage. If anything, the West got caught in its own bluff and bluster, as Putin showed how Russia rallied behind him and how he led the nation from the front. While claims remain of several air assets including EW Mi8s being shot down by Wagner PMC as they marched toward Rostov, there was no incidence of exchange of fire with Russian National Guards or local militia in any checkpoints placed on the M4. Russian law enforcement and military simply kept a vigil and watched as the long night dawned favourably on them.

If indeed this was an abortive coup, it is now clear that Russia is not going to be wished away even if Putin is removed from the scene. This ongoing SMO is part of a Russian strategic policy that has unwavering solidarity across political Russia. It showed that Russia is not a tin pot Nicaragua or Haiti or Panama that any armed group can overthrow. Even a mercenary group like Wagner PMC however motivated for its self-gain, still operated within the boundary of National Identity. In sharp relief, this incident threw up exactly why Putin backed Lukashenko in crushing the democratic verdict because if Belarus had become a pro-NATO democracy like how Ukraine had become, then Moscow would not have had the luxury of a secure Northern front along the Ukrainian borders and an interlocutor like Lukashenko to help resolve the Wagner issue.

The Aftermath

One hopes that this 'storm in a teacup' of the Wagner rebellion helps the West in seriously striving to end the war. The incident should have a sobering effect on Western capitals who are hoping for something giving way, making Russia just disappear from the scene.

It is clear now that after the initial surprise, the Kremlin reacted with admirable coordination and restraint, as they used several channels to communicate with the mercurial Prigozhin whose call it was that caused this scenario to unfold in the first place. Russia imposed movement restrictions on strategic motorways. Also seen were columns of Ahkmat Chechen militia mobilised and moving toward Rostov on Don even as Russian Guard units were seen in the outskirts of Moscow. Many Western observers were of the view that this coup would succeed and the fact that Wagner PMC was not challenged by Russian paramilitary or police and no major military formation was assigned the task of neutralising it in southern Russia was proof of a demoralised and defeated state, accepting this disruptor as a *fait accompli*.

if one were to banner anything from this churn, like how the nectar emerged from the churning of the mighty sea by the *Devas* and *Daityas* in *Kurma Avatara* of *Vishnu Purana*, in this churning something did emerge—Russian Nationhood.

The full truth of the supposed 'coup' may take decades to come out, if ever. But even then, there will be a gap between the premise and promise of this climatic chaos that swirled upon Russia for over 24 hours. Yet, if one were to banner anything from this churn, like how the nectar emerged from the churning of the mighty sea by the *Devas* and *Daityas* in *Kurma Avatara* of *Vishnu Purana*[13], in this churning something did emerge—Russian Nationhood. For the many who consider Russia an imperial artefact, this was a reality check that under a less than democratic setup—that Russia is by Western standards and that too under a leader who can be described as a populist authoritarian—Russia bounced back in a way that defied most Western banner heads that screamed 'mutiny', 'coup', rebellion' and predicted the end of President Putin.

Was this a PMC revolt or protest? Was this orchestrated by Russia? It appears from the responses of Defence Minister Shoigu and from the speech of President Putin,[14] that the Russians were taken by surprise, even as British and American papers and news websites claimed intelligence inputs had alerted the US Congress and British Cabinet to this scenario.

Impact on Future Warfare

The picture dramatised by Hollywood of mercenaries pursuing their own agendas in ousting or supporting tin-pot dictators is a picture of the past. The Americans too have greater oversight on the actions of their PMCs as has been seen in their use in Afghanistan and the Middle East. Wagner PMC and its manner of deployment by Russia in direct military operations in a specified sector has added a new dimension to the use of PMCs. It is this dimension which will have a greater impact on future warfare.

We do know that one aerial reconnaissance EW aircraft of Tu22M type was shot down and its 10-man crew lost their lives. Reports of downed Mi8s and one Ka52 proved to be not substantiated officially.[15] We know that the Wagner PMC left behind one T90S tank that got stuck on the streets of Rostov on Don. We also know that the rest of the Wagner melted away, turning westward toward the SMO Zone. President Putin made a broadcast on Russian TV in which he referred to the Wagner PMC crises as a litmus test of sorts for Russia and how Russians rallied in solidarity and patriotism to defeat the designs of the enemy and betrayers. He also assured the patriotic Wagner PMC of safe passage to Belarus, of fresh contracts with the Russian Defence Ministry, and of returning to their families and children as they so choose.

This shows that regardless of their 'loose-cannon actions" Wagner remains an asset that is of great use to the Russians, which is why Putin was ready to pardon some major transgressions to get them on the line. On the Russian part, too, more attempts will be made to formulate greater integration and rules to facilitate PMC deployment and operations. Wagner PMC is apparently too valuable an asset to the Kremlin to be deleted for this 'drama'. It is successfully providing muscle to Russian foreign policy. They have done it in the Middle East and are doing it in West Africa where they are now holding operations in Mali,[16] Burkina Faso[17] and now rumoured to have entered the stage in Niger.[18] Thus, Moscow's renewed efforts for global salience and relevance including deeper connection with Africa in particular is served well by the Wagner PMC. In fact, the most handsome left-handed compliment given to Wagner PMC is from the prestigious New York Times which wrote in a specialist guest opinion column in the fashion of "when in doubt send in the Marines": "If Your Country Is Falling Apart, the Wagner Group Will Be There".[19]

Defining Non-State Actors. In common perception, the term 'Non-State Actors' is used to refer to a range of armed groups that operate beyond state control. While the term may be sufficient to describe a State-facilitated mercenary

group as an American, British or Russian 'Non-State Actor', there is a requirement to widen the definition of 'Non-State' to include all aspects of popular and global influence that can alter the decision-making map of any State. Therefore, besides PMCs, they can include non-governmental organisations, multinational corporations, media outlets, terrorist groups, organised ethnic groups, academic institutions, lobby groups criminal organisations and others.[20]

No serious analyst will accept that a group like Wagner, Black Water or Mozart Company—the latter consisting of veterans from France, Germany, UK presumably who are rendering services to Ukraine—is capable of functioning without State support.

No serious analyst will accept that a group like Wagner, Black Water or Mozart Company—the latter consisting of veterans from France, Germany, UK presumably who are rendering services to Ukraine—is capable of functioning without State support. Firstly, most armaments are outside the kitty of personal firearms that private citizens have access to, secondly, airlift or seaborne effort is rendered by their native countries covertly or overtly, and thirdly there is an extensive element of 'black operations' with clear evidence of the hand of their State's intelligence officialdom, from mission tasking to deployment to withdrawal.

However, these mercenary groups do offer a veneer of mutually acceptable deniability, which is why the West did not notice or protest the extensive footprint of Wagner PMC first in Syria, then in Mali, the Central African Republic and other hotspots of Africa where their presence is documented. Nor can the West deny, the presence of their own mercenary groups, shoring up regimes across global hotspots and including services such as personal protection for VIPs in those regions.

So, when the West points a finger at Wagner PMC it would be the simple case of 'kettle calling the pot black'.

There is however a larger covenant that governs most of these mercenary groups, whether American or Russian. Those who die in conflict zones as committed professionals, receive the honour that is due as if they were soldiers for their motherland. In fact, US Army Sgt Maimer who as a veteran was slain in Bakhmut was identified by the late Yevgeny Prigozhin on the battlefield, and his mortal remains were returned to the US with full military honours. As Prigozin said in an online video, using the name of an American. "So, we will pass him along to the United States of America, we will put him in a coffin, and cover him

There is enough evidence of French, British, American and Belgian PMC horrors in the last 100 years, spawning and spanning from colonies to tinpot dictatorships. The Russian Wagner Group is just another addition.

with an American flag because he didn't die in his bed an old man but died in war and most likely in a worthy way, right?"[21]

So, these mercenary groups are not completely rogue, even though the State may accommodate them as 'Non-State'. They have their own honour code. Wagner even offered to compensate the Russian airman killed during the insurrection. Though in all likelihood the Russian state must have refused that. Wagner's public apology for their actions and its subsequent soft handling by the Russian State underscores the importance of PMCs. Putin himself in his speeches has never referred to Wagnerites as anything else but heroes of Russia Though he termed the insurgent action as an act of betrayal, he accepted to negotiate, waiving off charges and offering pardon in a deal that was midwifed by Belarusian President Lukashenko.

Conclusion

There is enough evidence of French, British, American and Belgian PMC horrors in the last 100 years, spawning and spanning from colonies to tinpot dictatorships. The Russian Wagner Group is just another addition.

The death of its founder Yevgeny Prigozhin in a mysterious air crash on 23 August 2023 will not lead to the decline of this group as it has proven utility to Russia. As of writing this article, only two assertions can be made for the foreseeable future. Firstly, Russia will continue to operate Wagner PMC with fresh leadership and secondly, no void will surface as a result of this air crash. An immediate statement by the advisor to the Central African Republic President, where Wagner had just deployed, is relevant. He said "It's sad news, he (Prigozhin) saved democracy so the country is in mourning. But for us, it changes absolutely nothing. We'll continue to have Wagners on the ground thanks to our agreement with the Kremlin".[22]

'Non-State' actors come in many shapes and forms. The young activist Greta Thunberg and actor campaigner for causes, George Clooney both are arguably examples of Non-State actors, whose conveyance of causes excites citizens beyond the borders of their home states. So, if Wagner PMC is seen as culpable Non-State Actors albeit of an armed variety, so in some quarters can be Ms Thunberg and Mr Clooney be considered unarmed but culpable 'Non-State Actors'.

So, this then is the most significant impact of PMCs on future warfare. They can be made heroes when waging a war by their core supporters, and painted black by equal mouthpieces when seen as upsetting chosen narratives. This genie in the bottle, unleashed as Divine or Satan as per convenience is of great value in Hybrid Warfare. When required for attritional war, they can be rapidly expanded in size, akin to calling reservists for war because, at their core, they are ex-soldiers, kept voluntarily in their prime. When not so required they can revert to their profession of diverse private or personal security providers. They can be sent to global hotspots with deniability while their presence is actually an extension of the military-diplomatic presence of their mother state.

The nature of warfare remains founded on the ability of nations to obtain replenishment of men and material to persist with military aims and objectives. What Wagner PMC has revealed is the capabilities of a 'fifth column' or quasi-state or non-state actor as a force multiplier or catalyst to crucial military and State objectives, be that in Africa or in Bakhmut. In the era of fiscal prudency and manpower downsizing, with military budgets of countries reducing the kitty available for buying increasingly expensive weaponry and in the era of 'white lies', PMCs are increasingly attractive prepositions for countries with diminishing military manpower pools or dread of flag-covered body bags.

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Counter Fire Operations: An Analysis with Future Perspective

RAJNISH MAAHI

Enthusiasm for counterfire operations usually grows as casualties from enemy artillery mount.

– Major General JBA Bailey[1]

Abstract

Up to the commencement of WW1, advancements in weaponry and munitions allowed the creation of effective killing zones. This progress in firepower had not been countered by matching technologies. The defensive equilibrium on both sides led to stagnation and enhanced focus on kinetic actions at the tactical level. To break this equilibrium, manoeuvre warfare as a counterforce philosophy was employed during WW 2. Post WW 2 emphasis began to be laid on long-range vectors seen during the Cold War period, as evolution in technology enabled military forces to engage in combat with unprecedented precision and efficiency. Near real-time intelligence derived on the battlefield led to greater focus on neutralising enemy firepower and intelligence assets before they could be used. The same technological developments and resultant evolved tactics also present significant challenges in terms of accurately acquiring targets and undertaking counter-bombardments. As nations strive to protect their territories and citizens, understanding

and overcoming these challenges becomes paramount in the formulation of effective military strategies. Hence the need to strive towards a Favourable Artillery Situation (FASIT) as observed unambiguously in the ongoing Ukraine-Russian conflict. This article carries out a brief analysis of the same and gives some recommendations for future warfare.

The execution of counter fire (CF) operations is a specific task for artillery units and is intended to destroy or neutralise an adversary's indirect firing platforms.

Introduction

Warfare in the future will be technology-centric with networked forces operating in a multi domain environment with a high degree of battlefield transparency. The primary focus still being on the denial of capability to the adversary and destruction of opposing forces during both contact and non-contact stages of conflict. The engagements are likely to range from non-contact or non-kinetic attacks to close combat assisted by suppression of enemy capabilities in all domains. This was seen in the recent Azerbaijan-Armenian and the ongoing conflict between Russia and Ukraine where firepower has been used as the most effective and potent tool at the operational level. Firepower has been employed using platforms ranging from missiles to aircraft, guns and rockets, attack helicopters, unmanned Combat Aerial Vehicles (UCAVs), drones, swarm drones and loitering munitions. Kinetic effects complemented by other non-kinetic resources like Intelligence, Surveillance & Reconnaissance (ISR), Electronic Warfare (EW) and cyber-attacks can cause disproportionate effects and prove decisive. When employed jointly, in an integrated and networked environment, the effects of firepower are non-linear and exponential. Dovetailed into it, is the need and importance of Counter Fire Operations towards a larger aim of achieving FASIT. The execution of counter fire (CF) operations is a specific task for artillery units and is intended to destroy or neutralise an adversary's indirect firing platforms.[2] The counter-fire operations are extremely relevant for the other arms as their protection from the adversary's fire support system depends on it. Moreover, depriving an adversary of his capabilities to conduct CF operations themselves allows for reassigning artillery assets to target the adversary's manoeuvre assets. Destroying an opponent's fire support capabilities is therefore a vital element of the combined-arms operation, which

makes its integration within the combined-arms efforts the responsibility of the force commander.[3]

Counter Fire Operations Over the Ages

The enthusiasm for this specific task has varied over the years since its conception. Many infantry assaults during 1915-1916 failed due to the inability to suppress the adversary's indirect firing assets, which left advancing formations easy targets for indirect fires.[4] Recognising this issue in 1917 there was a surge in techniques to detect the positions of opposing indirect firing platforms, which would, at the time, remain static for long periods and thus did not require the speed considered essential today. Interest in the concept declined after the First World War; developed techniques and technology were considered inadequate for mobile warfare that emerged on the brink of the Second World War. Ironically, the concept was quickly revived in 1942 when the British Army realised that the majority of casualties were inflicted by indirect fires instead of small arms fire.[5] Roughly one decade later, during the Korean War, the relevance of CF was exemplified. Estimates suggest that up to 70 per cent of all available artillery assets were assigned to CF operations during the conflict.[6]

Interest declined again after the Second World War. Curiously, the reason was similar to that of the aforementioned interbellum period. This was that target acquisition capabilities had not been kept technically current. At the same time some older techniques, e.g., flash spotting, and sound ranging, were rendered archaic. By contrast, the Soviets did not lose track of the role of CF operations, insisting that 'enemy artillery must be destroyed before the close battle is joined.[7] Their perception was to attain victory through superior firepower by exploiting the success of fire support with manoeuvre. NATO studied the effects of incorporating CF operations in their own modus operandi post analysing Russians during the Cold War. During Operation Iraqi Freedom the US Army conducted a limited and one-sided CF operation. One account estimated the result of over 150 enemy indirect firing systems destroyed along with 700 personnel killed.[8]

The relevance of adequate and accurate sensors can be understood through the current conflict between Russia and Ukraine. Reports concerning Russia's military tactics refer to its reliance on indirect fires combined with various sensors e.g., layered unmanned systems and electromagnetic equipment. Following the demonstration of Russia's capabilities, the US Army revitalized the

necessity of counterfire operations, which Western armed forces generally neglected whilst focussing on the wars in Iraq and Afghanistan.[9] The logical start to develop a counterfire doctrine would be exploring the most relevant aspects of conducting an effective counterfire operation.

Integrating and synchronising the CF plan with the manoeuvre plan is essential. Accuracy of information and fires, speed and effectiveness combine to determine the outcome of a counter fire battle.

The Analysis of Counter-Fire Operations as A Concept

US Field Army Manual 3-09.21 reflects that CF is not a separate battle, but one aspect of the overall combined arms battle. Integrating and synchronising the CF plan with the manoeuvre plan is essential. Accuracy of information and fires, speed and effectiveness combine to determine the outcome of a counter fire battle. The Royal United Services Institute of UK in an article namely 'The Future of Fires' indicates the suppression of enemy fires is the priority of one task of own military. The concept of FASIT is not a requirement associated with the Artillery but emerges as an all-arms requirement for the effective execution of combined operations in an integrated environment. The firepower provided must augment the effective manoeuvre of own forces mitigating the enemy threat which is majorly from the enemy firepower and support elements. It demands the formulation of an effective CF plan to turn the ratio of firepower in its own favour thereby achieving the desired end state. The same must address all elements of enemy firepower and must not be restricted to only guns/mortars.

The counterfire operation consists of proactive and reactive elements. Proactive measures aim to 'identify, locate, and attack to eliminate the enemy's strike capabilities before it can impact friendly operations.'[10] The reference to 'strike capabilities' seems limited to firing platforms; however, the sensors these platforms rely upon are of equal importance to strike proactively. Implementing these measures takes place during the decision-making process by analysing the adversary's total fire support system and contemplating scenarios to counter its use. In general, proactive CF measures are executed during the deep operation to shape the upcoming battlefield. Targets that are taken out in that phase will no longer influence future operations. During that phase reconnaissance assets will scout the environment to locate assets of, amongst others, the opposing fire support system. Combining recce elements with artillery is remarkably effective

in such operations. Accordingly, proactive components primarily require capabilities to detect the adversary's assets whilst they are inactive, and range and lethality to strike them effectively.

As a corollary, reactive measures direct fire against the opposing fire support system as soon as their action enables detection of their positions, thereby providing a response to an opponent's fire support assets that are employed in battle. This type of action requires:

- Sensor capacity to detect active systems.
- Range and lethality to strike effectively.
- A very robust sensor-shooter link hits the targeted system before it changes position.

A clear delineation between proactive and reactive measures in time or space, however, is impossible. As soon as the close operation commences, the force commander may want to direct his fire support assets accordingly. But that does not preclude the need for reactive measures against hostile artillery during the close operation, nor the exploitation of incoming intelligence with proactive measures in depth. The important facets of CF are as under

Sensors. These are active and passive ones. Their distinction is based on whether the system requires action or emits signals versus 'listening' to its environment. Active target acquisition systems typically entail reconnaissance units, weapon location radar, and (un)manned aerial systems Passive sensors usually refer to acoustics, and signal intelligence. By triangulation of respectively sound or electronic emission, these sensors generate a probable location of its origin.

Range and Lethality. Future battlefields are anticipated to become larger.[11] As fire support platforms are required to swiftly support different units, spread over that area, their effective range needs to increase accordingly.[12] The relative distance between own and opposing artillery dictates the possibility of conducting CF operations. The more extended its range, the more assets it can counter; for example, howitzers have little to fear from CF from mortars as howitzers outrange them by far. Moreover, artillery may have difficulty dealing with opposing counterparts when ranges are comparable. Consequently, artillery can avoid the effects of CF by increasing the relative distance. However, increasing the relative distance also reduces the ability to conduct effective CF operations, which allows an adversary to direct all its fire support assets towards its own manoeuvre forces. Rocket artillery—or specifically Multiple Launch

Rocket Systems—is often referred to as the go-to option for CF operations, as they were developed for exactly that.[13]

Counterfire would be most effective if the response is fired within 75 seconds after the enemy's first round.

Speed of Engagements. The final prerequisite for effective CF operations is rapid engagement. Its significance originates from improved survivability procedures: concealment, mobility of platforms, frequent changing of firing positions, dispersed deployment of formations, and roving guns and sensors. This makes platforms difficult to pinpoint and gives a small window of opportunity, thus, necessitating a rapid engagement. Undeniably, protracted firing procedures, e.g., registrations, adjusting fire, smoke screens, or illumination, make fire support assets vulnerable to an opposing CF operation. Counterfire would be most effective if the response is fired within 75 seconds after the enemy's first round.[14]

However, processing the target acquisition data into an engagement order takes time. During Operation Iraqi Freedom the US Army managed an average of 6m37s from detection to engagement.[15] The difference was primarily due to the interpretation of the rules of engagement and extensive risk mitigation.[16] That process could be careful yet fast by, for example, incorporating preliminary automated risk estimations by support systems, developing a 'risk map' in which the force commander designates in which areas certain risks are acceptable, or connecting risk acceptance to high pay-off targets can help diminish collateral damage.[17]

Airspace Saturation. This is an additional consideration. On the one hand, anti-access/area denial (A2AD) presupposes a limited role for air support, especially in the early stages of a conflict. On the other hand, windows of opportunity could be created and may require a fast response from air assets nonetheless. However, clearing airspace during the operation would hinder a timely response to the ongoing CF operation and the potential deployment of air assets. That means that an optimum must be found between continuously guaranteeing a rapid CF operation, but also enabling a swift deployment of air assets. Conceivably, this requires the joint force commander to decide which operation to prioritise during various phases of the conflict.

Dilemma of Engagement

A standard attack requires a preliminary artillery duel—a fight in which other arms practically do not take part. A successful duel (in early 20th century) meant

Conducting the CF operation during ground manoeuvres permits those elements to directly exploit the neutralisation of enemy artillery assets. Any military that is outnumbered in terms of artillery will find this a hard choice as the opponent does not face the same problem.

that manoeuvre elements were spared from advancing under enemy artillery fire. If the duel did not produce the desired results, the artillery would have to make sure that the opposing artillery could not engage undisturbed.[18,19] A focus on the adversary's artillery prevailed over the support of manoeuvre elements. This question remains relevant to both sides in a conflict even today: commanders have to determine which assets support which operation during what timeframe. For example, one side could fire with its howitzers at random, while having rocket artillery in position, to lure an opposing force into commencing their CF operations and give the position of their assets away. Employing rocket artillery, however, may invite the opposing force to do the same. Thus, the spiralling of an artillery duel commences.[20] The dilemma of the force commander may become harder when fleeting opportunity targets emerge which would warrant reprioritisation.

The other argument is that the CF operation is best conducted simultaneously with the ground manoeuvre. Combining both efforts produces multiple problems for the adversary, forces its commander to choose, and, thereby, increases his chances of making mistakes. Conducting the CF operation during ground manoeuvres permits those elements to directly exploit the neutralisation of enemy artillery assets. Any military that is outnumbered in terms of artillery will find this a hard choice as the opponent does not face the same problem. Larger numbers translate into the ability to simultaneously conduct CF efforts and support manoeuvre forces. To mitigate that advantage of the opponent one might opt for a duel instead. However, that may be the opponent's trigger to deploy the manoeuvre operation as well to counter that tactic. Hence correctly reading the artillery battle is an important facet of an endeavour to achieve FASIT.

Dilemma of Detection

The greatest disadvantage of the active sensor technique is that its use is detectable as well due to its emission of signals. These assets were used uncontested during the conflicts in the Middle East, but this could change

significantly when facing an equally competitive and aggressive adversary. Activating a radar, deploying air assets, and utility of omni-directional radios are likely to be detected and targeted by the opposing CF operation. This underlines the relevance of a well-balanced system of both active and passive sensors, a key for effective CF operations.

Recommendations

The imperatives to achieve FASIT are listed below:

- Centralised command of all artillery resources for the intended duration of FASIT.
- Specific allotment of all extrinsic kinetic and non-kinetic means/ formations as per requirements, coordinated at the highest level (Corps in this case) including the availability of required ammunition.
- Availability & allotment of ISR resources as per ISR Tasking orders generated for the intended duration of FASIT.
- Division of Area of Responsibility (FASIT specific) along the entire depth.
- Appreciation of comprehensive target array for CF operations along the depth continuum.
- Preparation of ISR taking order for CF cycle using Reconnaissance Observation Missions, UAVs, Photo Reconnaissance Missions, Satellite Imagery, Special Forces, EW and Trans-border Patrols and aligning the Technical, Signal and Human Intelligence effort for the intended duration.
- Quantifying the engagement requirements (number of targets) along the requisite depth based on ISR inputs divided into two categories: static and dynamic targets.
- Preparation of Counter Firepower Tasking Orders integrating all the firepower and non-kinetic resources.
- Institutionalised CF Cells integrated as part of the Division of intelligence & Surveillance Centre (DISC) and Corps of Intelligence & Surveillance Centre (CISC).
- Focus of CF Cells to remain on ISR & FIPTO cycles to ensure continuous engagement and PSDA.

A critical aspect for achieving a Favourable Firepower Situation through a well-orchestrated Counter Fire Operations is information management which involves two key areas:

- Timely & accurate target intelligence.

- Data management, Information processing and timely sharing with engaging vectors.

Conclusion

Fighting an agile and competitive adversary who relies on its automated fire support system necessitates the ability to counter that system. Undeniably, any field army needs a technologically dominant weapon and surveillance platforms integrated with state-of-the-art AI-based decision support systems to achieve supremacy in CF battles. The harnessing of technology with human cognitive abilities would be an ideal solution for such high-tempo or even long-drawn conflicts in future. The Zelenopillia attack orchestrated by Russian forces on Ukrainian Mechanised columns in 2014 during the war in Donbas showcased the might of integrating the LRVs, EW and aerial ISR capabilities to gain out-of-proportion dividends.[21] Similarly, GIS Arta, a military software used by Ukrainian Forces during the ongoing Russia-Ukraine war for accurate and precise artillery engagements presented another example of integrating technology into planning, coordination and execution of fires.[22] These small operations/ techniques indicate ingenuity, all-arms cooperation, boldness and deliberate planning which can lead to success on the battlefield. A similar approach is required to reformulate the overall concept of Favourable Firepower Situation and Counter Fire operations which has larger implications at operational and tactical levels and can accrue greater dividends.

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Cognitive Warfare in China's Active Defence Strategy

RAJEEV BHUTANI

Abstract

China is known to have a Cognitive Warfare doctrine also referred to as the "Cognitive Domain Operations" concept. China could influence the thinking of the civilian and military leaders as well as of the general public of the countries which it classifies as 'enemy' or competitors. Taiwan's National Security Agency (NSA) has alleged that China is waging cognitive warfare against their country. Chinese theorists who are involved in this field state that China can win a war using cognitive warfare without waging kinetic war. Such claims are difficult to achieve given the current science and technology related to this sphere. Therefore, China, while giving enhanced attention to cognitive warfare, will continue to arm itself with modern weapons of the physical domain, but it will take measures to improve and enhance the coordination between these two dissimilar domains.

Introduction

Attacking the enemy's mind is a concept as old as warfare itself. Since time immemorial, military commanders have devised means to attack the enemy's morale and will to fight. This practice has continued in the present times. However, the means adopted to create effects on human emotion and

cognition have changed due to the availability of new technologies such as information communication technology (ICT), Artificial Intelligence (AI), neuroscience and digital applications like social media. Because of these evolutionary changes, Cognitive Warfare has emerged as a new war-fighting concept.

Attacking the enemy's mind is a concept as old as the warfare itself. Since time immemorial, military commanders devised means to attack the enemy's morale and will to fight.

In 2003, the Chinese Communist Party's Central Committee and the Central Military Commission (CMC) approved China's "Three Warfares" as a People's Liberation Army (PLA) Information Warfare (IW) concept aimed at preconditioning key areas of competition in its favour. "Three Warfares" are composed of 'Psychological Warfare' to deter, shock and demoralise the enemy's armed forces and civilian populations; 'Media Warfare' to influence domestic and international public opinion; and 'Legal Warfare' to use international and domestic law to claim the legal high ground or assert Chinese interests.[1] The 'Three Warfares' are closely related to cognitive warfare. Many papers published by Chinese strategists in the early 2000s conveyed that future IW would "co-occur in three domains: the physical domains of land, sea, air, and space; the information domain of communication networks and information in it; and the domain of human cognition, which consists of both the leader's will and public opinion."[2] Qi Jianguo, the former deputy chief of staff of the PLA, stated that in the wars in the future, those who control the cognitive domain of their opponents would be able to defeat them with much lesser effort in the physical domain; embodying Sun Tzu's dictum of "breaking the enemy's resistance without fighting."[3]

Officially China adopted the military strategy of "Active Defence" in 2008, according to its White Paper "China's National Defense in 2008", which also emphasized composite development of mechanisation and informationisation of its armed forces.[4] Further, the 2019 Defense White Paper: "China's National Defense in the New Era", envisaged that efforts would be made to advance the integrated development of mechanisation and informationisation and speed up the development of an intelligent military, while foreseeing that 'intelligent warfare' is on the horizon.[5] Chinese strategists consider cognitive warfare as one of the key features of 'intelligent or intelligentised warfare'.[6] China could try and influence the thinking of civil and military leaders and the general public in rival countries. The US is concerned that China is working toward integrating AI into

Cognitive warfare, in its simplest form, refers to activities designed to control others' mental states and behaviours.

cognitive warfare for manipulating public opinion in Taiwan and it could also try to discredit US efforts to support Taiwan both in the eyes of the world and perhaps in the eyes of the Taiwanese themselves.

To analyse China's concept of cognitive warfare and how it intends to employ it as part of its defence strategy, this article studies the subject under the following heads:

- Defining the Concept of Cognitive Warfare.
- China's Cognitive Warfare Doctrine.
- Employment of Cognitive Warfare in China's Active Defence Strategy.
- Limitations of Cognitive Warfare.

Defining The Concept of Cognitive Warfare

Cognitive, deriving from cognition, is the mental action or process of understanding, encompassing all aspects of intellectual functions, including the subconscious and emotional aspects, that drive a majority of human decision-making. Cognitive warfare, in its simplest form, refers to activities designed to control others' mental states and behaviours. While cognitive warfare lacks a universally accepted definition, the one given by NATO's Strategic Warfare Development Command is more appealing—"the activities conducted in synchronization with other instruments of power, to affect attitudes and behaviours by influencing, protecting, and/or disrupting individual and group cognitions to gain an advantage."[7]

Cognitive Warfare is often entangled with IW and cyberspace warfare. Hence, it is necessary to distinguish between them. While Cyber Warfare can be used to spread disinformation, its main focus is on an enemy's infrastructure. It also can steal intelligence by carrying out distributed denial-of-service (DDoS) attacks. It is because of this that web security becomes critically important. IW targets human decision-makers; it can be launched via online social media and offline interpersonal networks. In contrast to IW, Cognitive Warfare extends from focusing on media control to brain control and it relies more on neurological resources than just mass communication techniques. For example, it does not only focus on the input (information flow) alone but also on the cognitive system and its output (behaviours), such as manipulating the brain's system by nudging, or system coercion to mould the enemy's perception and behaviours.[8]

China's Cognitive Warfare Doctrine

China is known to have a coherent Cognitive Warfare doctrine also referred as the "Cognitive Domain Operations" concept.[9] Like many previous developments in the PLA, this concept also seems to have been drawn from the US, as the 2001 US Department of Defence Report to Congress on "network-centric warfare" first introduced the concept of the cognitive domain to go along with the physical and information domains.[10] The goal of cognitive domain operations is "mind superiority", using psychological warfare to shape or even control the enemy's cognitive thinking and decision-making. According to China's National University of Defense Technology (NUDT) researchers, the cognitive domain can be divided into two categories, with three technologies in each: The first, cognition influence includes technologies that affect someone's ability to think and function; the second, subliminal cognition covers technologies that target a person's underlying emotions, knowledge, willpower and beliefs.[11] These are covered in detail in the succeeding paragraphs.

Quantification of brain signals will enable better internal or external control over cognitive processes and that is also critical for human-machine teaming. An effective human-machine teaming on the battlefield would enable linking warfighters directly to weapons systems.

Cognitive Influence Technologies

Cognitive Survey Technology. This covers the collection and analysis of physiological signals of the brain. Theoretically, if cognitive processes can be converted into quantifiable signals, they can be tracked and lend themselves to be changed to the desired patterns. Quantification of brain signals will enable better internal or external control over cognitive processes and that is also critical for human-machine teaming. An effective human-machine teaming on the battlefield would enable linking warfighters directly to weapons systems.[12]

- Cognitive Interference Technology. It is used to cause physical interference or damage to the brain. Electromagnetic waves and microwaves can cause "psychological damage, confusion, and even hallucinations, changing the other's cognition, and ultimately causing the enemy to act in violations of their own interests."[13] A major advance in this sphere with far-reaching impact would be the development of technologies to cause physical disruption to

the brain. If this can be done from a suitable stand-off distance it could be a game-changer. For example, in 2016, US diplomats and CIA officers in Cuba abruptly began reporting symptoms of dizziness, nausea, and cognitive difficulties. Commonly referred to as the "Havana Syndrome", it was believed that the symptoms might have been caused by a concentrated microwave weapon. Though, after scientific investigations, the true cause of these injuries could not be established but a doubt has arisen in the US security setup whether its enemies have a weapon that could cause brain damage from a distance.[14]

- **Cognitive Strengthening Technology.** It is used for improving one's own cognitive abilities. These technologies may include new medications for increasing concentration of the mind, sharpening focus and changing mood to a more confident level. Brain implants for "thought reading" would give greater capability to trainers. This measure and specific training environments could increase the cognitive ability of soldiers. Enhancing cognition in this manner could increase a soldier's decision-making speed and increase cognitive resilience under battlefield stressors. These bio-enhancements could keep soldiers fighting harder, for longer, in more difficult conditions.[15] For instance, the PLA Daily reported that the force was working on technology that can be worn by the soldier as part of his/her equipment and a "psychological support system" to better prepare soldiers for real combat situations. Reportedly, soldiers in a growing number of units were being given smart sensor bracelets that "continuously record the facial information of officers and soldiers, judge their psychological state in real-time through data feedback, and archive them".[16]

Subliminal Cognitive Influence Technologies

These encompass the development of technology and methodologies that prepare and distribute content that is in favour of the desired narrative. Technologies employed as per Janna Mantua a researcher with a prominent think tank with a PhD in Behavioral Neuroscience are:[17]

- Subliminal Information Processing Technology to "collect and pre-treat" content.
- Subliminal Information Implantation Technology "to implant subliminal messages into content, and to create 'synthetic information'". For instance, China employs internet commentators, or "wumao" to spread propaganda online that is consistent with the State's interests.[18] They also selectively

amplify the voices of influencers, including Westerners, who are promoting China of their own volition.

- Subliminal Information Detection Technology is presumably used for defensive purposes against adversary use of subliminal messages.

Employment of Cognitive Warfare in China's Active Defence Strategy

Officially, China has adopted a military strategy of "Active Defence" but contrary to the Western meaning of the term 'defence', Chinese strategic thinking does not relate it to 'striking only after the enemy has struck or waiting for the enemy's strike passively'. Past precedence from its history illustrates the ambiguity of China's strategic thinking as also the justification of pre-emptive military action at the operational and tactical level under the guise of Strategic Defence.[19] China's hybrid warfare, intelligentised warfare, and grey-zone warfare activities, all fall under its overall strategy. China launched a series of coordinated "cognitive warfare" campaigns targeting Taiwan in addition to the PLA's frequent air force incursions into Taiwan's air zone. Taiwan's National Security Agency (NSA) charged China with launching a cognitive warfare against Taiwan.[20] Consequent to China's belligerent stance in the South China Sea and East China Sea from 2020 onwards, various hypothetical scenarios are being deliberated upon in the US, Japan and Taiwan strategic communities as to how China would use Cognitive Warfare in concert with other means of warfare in a multi-domain battlefield. One of the possible employments of Cognitive Warfare by China is discussed in the succeeding paragraph.

It is not clear how the Chinese intend to use future technology to control the enemy brain. But with the currently available technology, the PLA seems to be considering browbeating its opponents through military actions and the use of disinformation. This could take the following five stages in a Taiwan scenario:

- A misinformation campaign could be conducted to affect Taiwanese citizens psychologically. This would be with the intention of negatively affecting their morale. Disinformation could be disseminated through television and social media. Taiwan is more susceptible as "it maintains a high internet penetration rate of about 92 per cent, with heavy usage of social media platforms."[21]
- Deepfake videos of a false-flag operation could be used to sow dissension among the American public and leaders over US involvement in the Pacific.
- Brain-damaging weapons could be used against senior commanders to decrease readiness and create decision dilemmas.

In Cognitive Warfare, influencing the cognitive domain in other countries requires a deeper understanding their culture. This is to identify targets, and create strategic narratives customised for those targets' characteristics.

- Manoeuvring and deploying troops to specific locations and undertaking military exercises for intimidation purposes.
- Upon the initiation of conflict, the PRC's human-machine teaming capabilities could enable seamless Observe, Orient, Decide, Act, or OODA loops, that support the PRC's anti-ship campaign and deny the US entry into the operational theatre.[22]
- A prolonged war in which the Chinese bio-engineered soldiers may be able to fight better than their opponents and ultimately defeat them getting them their priority one goal of integrating Taiwan into China.

Limitations of Cognitive Warfare

Unlike warfare in physical domains of land, sea, air and space, in which technologies, techniques and tactics are universally applicable, irrespective of the country or the people against whom these are applied, Cognitive Warfare, influencing the cognitive domain in other countries, requires a deeper understanding of their culture. This is to identify targets, and create strategic narratives customised for those targets' characteristics. To achieve this, it is essential to develop the necessary cyber, psychological and social engineering capabilities. Amassing a great deal of detailed personal information about the target country is a prerequisite for Cognitive Warfare to succeed. Reportedly, China has already collected a huge bank of data on government officials and ordinary U.S. citizens, "ensuring a foundation for influencing people's perceptions."[23] This is precisely why the US has long accused China of stealing personal data.

Cognitive warfare alone cannot win wars. "Coordination between cognitive warfare and other operations is essential because the means of influencing an opponent's perception include not only the transmission and disclosure of information but also intimidation and deterrence through the actions of physical assets, as well as the digital dissemination of information."[24]

The Russia-Ukraine war has shown that cognitive warfare alone cannot win wars. Hence too much emphasis should not be placed on the capabilities. Even if the science was available poor data quality would result in flaws in algorithms. Getting the correct data is itself a challenge. Hence too much emphasis should not be placed too much emphasis on their capabilities.[25] While the practicability

of leveraging AI to affect human cognition remains unknown, development is going on in this field and this form of warfare must be studied.

Conclusion

The idea of directly influencing human cognition is not new. China is known to be using social media extensively to target tailored messaging to specific audiences and manipulate public opinion in its favour. Taiwan would be the best-case study of the applications of the PLA's cognitive domain operations, especially in so far as social media disinformation is concerned. How much detail China can go into is clear from the fact that in propagating they have even altered typical mainland Mandarin sentence structure and vocabulary to sound more like that of Southern Min, the dialect used in Taiwan.[26] The use of AI and big data analytics will enhance their capability manifold.

The Russia-Ukraine war has shown that cognitive warfare by itself cannot win wars. Also claims by Chinese theorists that they would win a war using cognitive warfare alone are not feasible.[27] Having learnt these lessons, China, while focusing on cognitive warfare, is likely to equally invest in existing physical domains and enhance the coordination between them. One needs to analyse China's concept of cognitive warfare as part of its intelligentised warfare while also studying the coordination of operations in the cognitive, informational, and physical domains.

At the time of the Galwan India-China border tension at LAC in Ladakh, three years ago, a British daily "The Times", citing a Beijing-based professor, reported that the Chinese military used microwave weapons against Indian soldiers during the standoff in Eastern Ladakh. As per the UK newspaper, Renmin University professor of international relations Jin Canrong said, "In 15 minutes, those occupying the hilltops all began to vomit … they couldn't stand up, so they fled. This was how we retook the ground."[28] The professor claimed that the attack took place on August 29. The Indian Army issued a denial immediately and said that China was seeding ''fake news'' about using microwave weapons.[29] This was a cognitive domain operation with practically no effect. However, the crux of the matter is that China will continue carrying out cognitive domain operations against India, not only against the troops deployed on LAC, but may also try to influence events such as the upcoming national elections through deep fakes in social media, spreading disinformation and manipulating public opinion to suit its own national interests. The war in Ukraine has shown that the best weapons of a democratic society against

such Cognitive Warfare are accurate publicity and the rapid dissemination of information.

Brigadier (Dr.) **Rajeev Bhutani** (Retd) is a keen China watcher and Author. Views expressed are personal.

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SCHOLAR WARRIOR

SECTION II

GEOPOLITICS AND RESOURCES

CENTRE FOR LAND WARFARE STUDIES

New Developments in West Asia and Implications for India

MD. MUDDASSIR QUAMAR

Abstract

India's profound interconnectedness with West Asia makes it vulnerable to new developments in the region. It necessitates a deeper understanding of the geopolitical shifts taking place there. The Western Asia region acquires ever more importance for its foreign policy due to India's multifaceted interests associated with the region. This extended neighbourhood of India has begun to move on from the turmoil caused over the decade since the Arab Spring uprisings—but the future remains uncertain. The regional geopolitics remains in flux due to the absence of a dominant power, especially as West Asia continues to lose its centrality in US foreign policy. Conversely, China has been preparing the ground for an intricate strategic involvement in the region. The regional powers after years of competing for geopolitical influence have begun to show signs of engaging in diplomacy but the combustible nature of the region remains a threat. Hence, it becomes ever more important for India's foreign policy to take the ongoing developments in West Asia into account while devising the future course of engagements.

Introduction

West Asia is one of the most important regions in India's extended neighbourhood. India has significant trade, business, investment and economic relations with

the region, in addition to robust diplomatic and political ties. In recent years, India has developed close strategic partnerships with important regional countries, especially the United Arab Emirates (UAE), Saudi Arabia, Israel, and Egypt. The significance of the region lies in its centrality to India's energy security and the safety and security of the nearly 8.9 million Indian expatriates[1] residing and working in the six Gulf Cooperation Council (GCC) countries. Besides, the region is important for maritime security in the Western Indian Ocean, and the safety of its sea lines of communication (SLoCs). Further, the West Asia region acquires importance for India's access to Afghanistan and Central Asia. From a strategic perspective, the region is critical to countering Pakistan's efforts at internationalising the Kashmir issue, and its attempts to isolate India in the Islamic world.

The post-Cold War recalibration in Indian foreign policy rekindled the engagements between India and the GCC countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE while India also established diplomatic relations with Israel, and continued its engagements with Iran.

The trade linkages and cultural contacts between India and West Asia go back to historical times. Archaeological findings indicate extensive trade and cultural links between Sumerian and Indus Valley civilisations.[2] The maritime contacts between the Indian subcontinent and the Arabian Peninsula are traced to the early medieval period with Arab sailors and merchants visiting the southern coastal regions of India to trade in horses, spices, swords, dates, and cotton yarns.[3] These contacts continued in modern times, and Gujarati, Sindhi and Kutchi trading communities developed a robust business presence in the coastal towns and cities along the southern Persian Gulf and Gulf of Oman.[4] The northwestern part of India had close contact with Iran with which India shared a land boundary until 1947. Independent India continued to have extensive engagements with the Arab world, especially with Egypt, Iraq and Syria, while extending support to the Palestinian national movement.[5]

The post-Cold War recalibration in Indian foreign policy rekindled the engagements between India and the GCC countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE while India also established diplomatic relations with Israel, and continued its engagements with Iran. Thus, the early 1990s showed signs of the beginning of India's multi-aligned policy in West Asia which has become a hallmark of its engagements with the region in the 21st

century.[6] Although the relations with the region were robust earlier, it has taken a leap forward under Prime Minister Narendra Modi due to frequent diplomatic and political engagements, stronger security and defence cooperation, and extensive trade, business and investment partnerships. This has transformed India's bilateral relations with UAE, Saudi Arabia, Oman, Israel, and Egypt to strategic partnerships. Furthermore, India has begun engaging the region through mini-lateral initiatives such as the quadrilateral I2U2 (India, Israel, US, and UAE) and trilateral India-France-UAE besides becoming an associate partner of the Bahrain-based and US-led Combined Maritime Forces.[7]

Notwithstanding, engaging the region remains challenging due to its dynamic, fractious and combustible nature. West Asia is known for being unstable and susceptible to fast changes. During the decade since 2010, the region (including North Africa) witnessed instability due to mass uprisings in several countries (known as the Arab Spring) leading to numerous civil wars, such as in Syria and Yemen (as well as Libya in North Africa). There have been extensive geopolitical contestations among regional actors including Saudi Arabia, UAE, Qatar, Egypt, Iran and Türkiye for greater regional influence and power.[8] Although the Arab Spring-induced instability and proliferation of terrorism has subsided, the region is undergoing important changes that can have long-term implications for regional politics and order. Broadly, ten emerging geopolitical trends can be identified that can have wider implications for West Asia, and in turn, can be critical for India's interest and engagements in the region.

Emerging Regional Trends

The Gulf Region. The Gulf Arab countries, especially Saudi Arabia, UAE, and Qatar have acquired greater significance in regional politics and this is likely to continue in the future. Saudi Arabia has traditionally held greater influence due to its oil wealth, Islamic centrality and Arab leadership. But in recent years, the fast-paced economic and social reforms have highlighted its desire to adjust to the changed realities both internally and externally.[9] While the threats from home-grown terrorism have driven the Kingdom away from fundamentalism, externally it has become more assertive in a changing global environment. On the other hand, both Qatar and UAE, are recognised as small but ambitious Gulf states that no longer wish to remain satellites of Saudi Arabia.[10] Overall, the Gulf monarchies have become more assertive and proactive in regional politics, and have begun articulating their strategic autonomy. They continue to depend on the US for security, but wish to diversify their international engagements, have

reduced ideological entanglements and have become more attuned to realpolitik. Although this has, at times, led to diffusion and tension among the members of the GCC, as was witnessed during the Qatar crisis (2017-21), it has also underlined the desire among Saudi Arabia, Qatar and UAE to play more proactive roles in regional, and international politics.

The problem between Iran and the US, especially over the Iranian nuclear programme, has continued to define regional politics in the Gulf and West Asia.

Iran. Iran remains a regional and international pariah so far as regional politics is concerned. The problem between Iran and the US, especially over the Iranian nuclear programme, has continued to define regional politics in the Gulf and West Asia. Since the US withdrawal from the Joint Comprehensive Plan of Action (JCPOA) in May 2018, the US-Iran tensions have remained high and despite the Biden administration resuming indirect talks in Vienna, the revival of JCPOA remains elusive.[11] In the meantime, Iran has gradually expanded its military and strategic influence through its proxies including in Iraq, Syria, Lebanon, Palestinian territories and Yemen. It has also looked towards Russia and China to break its economic and political isolation from the West with a degree of success.[12] Notwithstanding, the internal situation in Iran has continued to be a challenge for the Islamic Republic given the widening socio-economic problems, and rising political unrest as was reflected through the Mahsa Amini protests in 2022-23. Nonetheless, Iran remains strategically important for its size and location, its increased strategic influence in West Asia, and most importantly due to the US withdrawal from Afghanistan and the return of the Taliban to Kabul.

Türkiye. Türkiye has been recalibrating its foreign policy choices since 2021. Under Recep Tayyip Erdoğan, Türkiye emerged as an ambitious and assertive regional actor and this was reflected in its pursuit of power politics in the wake of the Arab Spring.[13] However, this not only isolated Türkiye in West Asia, it also created serious internal and external challenges, that in turn, harmed its economy further challenged by the outbreak of COVID-19. In large part due to the economic compulsions since 2021, Türkiye has gradually begun seeking reconciliations with its West Asian neighbours including Saudi Arabia, UAE, Israel and Egypt.[14] Although Türkiye remains an ambitious regional actor, it has toned down its assertive posture paving the way for reducing geopolitical contestation in West Asia. Türkiye's relations with the US and Europe, however, remain bitter, but the tension has come down due to its ability to play a mediatory role in the

Ukraine crisis that other North Atlantic Treaty Organisation (NATO) members are unable to do.

Israel. Israel has faced internal political instability due to frequent elections and changes of government over the past few years. The biggest challenge has come from the vertical socio-political split among the population over the proposed judicial reforms by the Benjamin Netanyahu-led government that came to power after the November 2022 elections, and is deemed the most right-wing government in the history of the Jewish state.[15] Netanyahu's refusal to leave active politics is premised on his fear of judicial prosecution over alleged indulgence in corrupt practices while being in office, and this has infuriated a large section of the Israelis. Notwithstanding the political problems, Israel remains one of the most stable regional economies and a military powerhouse. However, the continued Palestinian statelessness and outbreak of frequent clashes between the Israeli forces and Hamas, and other militant Palestinian organisations, remains a cause of concern for the international community.

Iran-Israel Proxy Wars. There is growing tension and proxy conflict between Iran and Israel. The non-resolution of the Iranian nuclear issue is alarming for Israel which views it as a serious security threat. Israeli leaders have on several occasions underlined that all bets are on the table if Iran continues to pursue its nuclear programme, and seeks a bomb.[16] Israeli military and political leadership also views Iranian expansion of its military presence in Lebanon, Syria, and Iraq as a strategic threat and considers the proliferation of non-state actors in the Middle East a serious threat to Israeli security.[17] Alternatively, Iranian leadership remains ideologically and rhetorically opposed to the Jewish state, and considers it an illegitimate American outpost in West Asia.[18] Anti-Zionism and anti-Semitism have defined Iranian behaviour towards Israel. But the most challenging aspect of the Israel-Iran tension is the proxy war between the two in Iraq and Syria that if not contained has the potential to inflame the entire region.

Importance in US Foreign Policy. The region has gradually become less important in US foreign policy priorities as a result of the pivot to Asia and the Indo-Pacific. This has far-reaching implications for West Asia. The US has since the end of the Cold War remained the most important and influential external actor in the region, and the regional politics and order has revolved around US foreign policy.[19] However, the rise of China as an economic powerhouse in the 21st century has created a conundrum for the US that has been reflected

in it focusing more on the Indo-Pacific thus showing reduced appetite for involvement in West Asia.[20] In hindsight, this has also been informed by the disastrous military campaigns the US undertook in Afghanistan and Iraq in the aftermath of the 9/11 terrorist attacks, and an equally ill-conceived NATO intervention in Libya in the wake of the Arab Spring. Consequently, there is greater geopolitical tension, rivalry and contestation among regional actors to assert their power and influence. Although the US remains the only major external military power to have a substantive presence in the region, it is increasingly less inclined to use its military to maintain regional security and order.

The growing economic interdependencies between China and the West Asian countries have started to translate into China's growing strategic and political engagements in the region.

China. China has incrementally increased its economic engagements in the region through bilateral trade and investments, and also through the mega connectivity projects known as One Belt One Road or the Belt and Road (BRI).[21] Consequently, China has replaced the US as the biggest economic partner of many regional countries. The growing economic interdependencies between China and the West Asian countries have started to translate into China's growing strategic and political engagements in the region. A manifestation of this was its mediation of the Saudi-Iran reconciliation agreement in March 2023.[22] The growing engagements accrue China a clear advantage over others aspiring to complement or supplement the US regional involvement in West Asia. Nonetheless, China faces an uphill task in its ambition to break the US domination of the international order, and more so in creating alternative economic and political orders. What is clear, however, is that in China's plans for expanding its international presence, West Asia features prominently.

Pakistan. In the over two decades since 9/11, Pakistan has gradually lost its influence in the region due to numerous factors. In the past, Pakistan had the ability to influence the Gulf Arab country's attitude towards India due to the former close strategic relations with the Gulf monarchies based on Islamic brotherhood, military and economic interdependence, Western alliance, and most importantly due to Pakistan's ability to secure a nuclear bomb.[23] However, over the years, due to several reasons, including increased terrorist threat, domestic political and economic troubles in Pakistan, and most importantly the rise of India as an economic powerhouse, Pakistan's attractiveness in the

eyes of the Gulf Arab countries has diminished. This has meant that Pakistani ability to influence the Saudi, Emirati, and other Arab views and understanding of India has substantially reduced as was visible from their response to the Indian decision to abrogate Article 370 of the Constitution that accorded special status to Jammu and Kashmir (J&K) in August 2019.[24] Moreover, the increased internal instability and financial troubles have made Pakistan a liability for the Gulf countries.

Epicentre of Anti-Terrorist Actions. A notable aspect of the region is its centrality in the fight against international terrorism and the continued threats from fundamentalist, extremist, and militant ideologies and groups. Although the Islamic State (ISIS) and the Muslim Brotherhood are respectively militarily and politically defeated after their ascendance in the wake of the Arab Spring, both remain a potent ideology, and continue to have loyal followings. Adding to the challenge is the rise of numerous other militant groups in between these two extremes of the Islamist spectrum, including the Shia fundamentalist and militant organisations propped up by Iran. This proliferation of non-state actors wielding substantive local and transnational sway in West Asia poses a serious threat to its security and stability.[25]

Reconciliations. Finally, not all geopolitical trends in the region are negative and alarming. There is a clear sign of an increasing trend of reconciliations among regional countries engaged in intense geopolitical contestations over the decade since 2010. The trend started with the signing of the Abraham Accords in September 2020 between Israel, the UAE, and Bahrain, and this was later joined by Morocco and Sudan.[26] This was followed by the signing of the Al-Ula Declaration in January 2021 ending the over four-year discord between Saudi Arabia, UAE, Bahrain, Egypt and Qatar.[27] Subsequently, Türkiye began a set of reconciliations with regional countries including UAE, Saudi Arabia, Israel and Egypt. And, this was followed by the announcement of the Chinese-mediated, Saudi-Iran deal for reviving their diplomatic ties in March 2023, and in May 2023, Syria was re-inducted into the Arab fold with its participation in the Arab League Summit in Jeddah.[28] These reconciliations largely emanate from a combination of geo-political and geo-economic considerations wherein the Gulf Arab states and other regional actors are concerned about the reduced US commitments in the region, while also trying to overcome internal economic challenges to avoid an Arab Spring-like uprising. Security considerations have also likely played an important role in prompting regional countries to seek better relations with their neighbours. Further, the US is also encouraging Israel and Gulf Arab states to

normalise relations leading to increased speculations that Saudi Arabia might follow the Emirati example.[29]

Implications for India

These regional trends are notable for their possible impact on India's interests and engagements in West Asia. They can pose direct and indirect threats to India's economic, political, security, and foreign policy interests. India has multiple interests in West Asia. Threats from terrorism and Pakistan, and to maritime security in the Western Indian Ocean are significant from a strategic point of view. Economic engagements with the region, including energy imports, trade, and investments, are vital for India's growth story. The safety and security of Indian expatriates, and the remittances sent by them, is an important consideration in the foreign policy calculus towards the Gulf and West Asia. The threats to the stability and security of the West Asia region, whether due to terrorism, militancy, or internal challenges from an Arab Spring-like situation, or in the likelihood of increased tensions between regional countries, and reduced US commitments, poses several questions for India.

If one looks at the trajectory of India's engagements in the region, it has preferred bilateralism over multilateralism within its pursuit of a multi-aligned foreign policy. This means that India prefers developing and cultivating bilateral ties with regional countries without taking a proactive stand on regional matters.[30] Further, it balances ties with regional rivals and in conflict situations such as between the Israelis-Palestinian, Arabs-Israelis and Saudis-Iranians. Under Prime Minister Modi, India has begun adopting greater flexibility in foreign policy postures without compromising on its core positions and this has been reflected in West Asia as well. Hence, Modi de-hyphenated relations with Israel to India's support for the Palestinian national aspirations, and has made its engagements in the region interest-based without necessarily abandoning traditional ties. India has also become amenable to multi-lateral and mini-lateral engagements, thus, in February 2019, External Affairs Minister Sushma Swaraj attended the 46th Organisation of Islamic Cooperation (OIC) Council of Foreign Ministers meeting hosted by UAE.[31] Moreover, India has been participating in an initiative like I2U2 while also proactively seeking regional participation in the International Solar Alliance (ISA). The gradual de-hyphenation of Pakistan, and close bilateral relations with Gulf Arab countries has meant that Pakistan has lost its ability to influence the regional actors' attitude towards India.

Nonetheless, the challenges for India emanate from the fast-paced changes in the regional political environment that has the potential to alter the regional order. This is happening due to the complex interplay of regional and international geopolitics. At the regional level, Iran's ability to expand and strengthen its regional presence and influence regional political outcomes have been noticeable. Moreover, Iran has sought to partner with Russia and China to develop greater regional domination and hegemony. This has alarmed other regional actors, especially Israel and Saudi Arabia, and both have reacted sharply to this. While Israel has sought to militarily fight Iranian presence in Iraq and Syria, Saudi Arabia has gradually moved to engage Iran. These can alter the regional order given that the US has been less inclined towards involvement in regional politics, mainly because of its pivot to the Indo-Pacific. This has provided space to Russia and China for increased involvement in the region. Given the current situation in international politics and the growing tensions between the US and Europe vis-à-vis China and Russia, this can seriously impact regional geopolitics. In short, the interplay between regional and international geopolitics can keep the regional order in West Asia in a state of flux in the coming years.

From an Indian point of view, this may not be an ideal situation. A regional flux means serious challenges for India both in terms of its interests in the region and a test of its international ambitions as a rising power. A complex challenge like the one in West Asia demands a complex policy option. This would mean three things in the immediate terms from an Indian foreign policy perspective. One, India will have to continue its extensive and close engagements with the region in a multi-aligned format; that is, continue engaging with all the regional actors. India has been doing this but there is scope for enhancing bilateral ties, especially security ties and military engagements with Gulf Arab countries. This is important given that the bulk of Indian economic and security interests in West Asia are aligned with the GCC countries. Two, India needs to further its engagements with the region through multi-lateral organisations and mini-lateral initiatives including to be able to remain more engaged in regional politics. Besides others, the Shanghai Cooperation Organisation (SCO) and BRICS offer India a chance to develop greater regional engagements.

Finally, India needs to take a more considered view of the ongoing developments in international politics and its impact on West Asia. The most

important point for India to consider is the impact of developments in the Indo-Pacific on West Asia. A key point to be noted here is that the Indo-Pacific and Persian Gulf are two regional security complexes that are separated by the Indian Ocean but can impact each other, and can also become interlinked, in case of the intensification of the tensions and rivalry between the US and China in any of these two theatres. Given that India is engaged in both these theatres, the challenges for it increase manifold requiring Indian foreign policy and strategic establishment to remain ever more vigilant of the developments in the Gulf and West Asia regions. This means that going forward, a greater degree of discussions and consensus among domestic stakeholders in the diplomacy, policy-making and security establishment with inputs from academia and the strategic community is needed for devising India's future approaches towards West Asia.

The Indo-Pacific and Persian Gulf are two regional security complexes that are separated by the Indian Ocean but can impact each other, and can also become interlinked, in case of the intensification of the tensions and rivalry between the US and China in any of these two theatres.

Conclusion

The West Asia region is one of the most important regions in India's extended neighbourhood with vital interests for India and strategic implications in multiple domains. India's age-old linkages with the region, and strong political, diplomatic, economic, and security ties with the regional countries give it an advantage in terms of developing good relations with the regional countries. India has done well to keep itself immune from the regional vagaries that can harm its economic and security interests linked to the region. Nonetheless, the ongoing complex interplay of regional and international geopolitics has made the region highly susceptible to instability, and this needs greater Indian scrutiny and consideration. In a globalised international environment wherein India's position as a rising power has given it a wider international canvas to showcase its strategic and foreign policy prowess, besides the Indo-Pacific, West Asia poses an important challenge for New Delhi. In the long run, the Indian response can have implications for the wider Indian interests in the region, but also for the direction of regional politics and order in West Asia. For New

Delhi, this opens a window of opportunity to explore the possibility of greater engagement in the region, with possible implications for its international role and status.

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Critical Minerals and India's Defence Sector: Addressing the Need for Resource Security

SHUSHANT VC PARASHAR

Abstract

Critical minerals are crucial for military and national defence. However, their security needs improvement, especially during global conflicts. Countries like the USA, EU, Japan, Canada, Australia, and China have created their catalogue of critical minerals, highlighting their importance. India needs to equip itself to enhance its role in the global governance of these minerals. A strategy to maintain reserves of these minerals is essential for their continued supply to our defence sectors.

Introduction

Critical minerals are vital today due to their extensive applications in various sectors and industries. Within the inner workings of advanced technologies, these critical minerals underpin numerous sectors ranging from electronics to renewable energy and, most importantly, defence. The defence sector mainly requires a steady supply of these essential minerals to support the production and operation of advanced weapon systems, aerospace technologies, communication devices, satellites, and more. These critical minerals are not

These critical minerals are essential yet have limited availability, growing requirements, and complex processing procedures and production is concentrated in a few countries.

mere luxury commodities but vital ingredients that ensure national security and technological advancement.

The crux is that these critical minerals are essential yet have limited availability, growing requirements, and complex processing procedures and production is concentrated in a few countries. With the increasing pace of innovation and rising geopolitical conflicts, the significance of securing these necessary minerals has become apparent. To comprehend the gravity of the situation, there is a need to delve into the intricate nexus of essential minerals and defence technologies, understanding the role each plays and the repercussions of a potential shortage. This paper explores the relationship between crtitical minerals and India's defence sector, underlining the pressing need for a robust resource security framework. It is not merely an exploration but a clarion call for a strategic approach towards ensuring mineral security.

Global Scenarios: Critical Minerals and Defence Industries

Looking beyond the borders of India, one can see that the issue of critical minerals is far from being a regional problem. It is a global conundrum casting a long shadow over the defence sector of numerous countries. To paint a clearer picture, let's look at the quintessential example of the USA. The Department of Defence (DoD) has identified 35 mineral commodities crucial to the country's security and economic prosperity[1]. The reliance on imported Rare Earth Elements (REEs) stands out starkly. REEs like Neodymium and Praseodymium are essential for producing high-strength magnets in guided missiles[2] and fighter aircraft[3].

On a parallel track, China is emerging as a key player in the global critical minerals market as it is the largest producer of REEs and holds the capability to refine them as well. This dominance over the production and refinement of REEs places Beijing in a powerful position with the ability to disrupt global supply chains[4]. Trade disputes between the USA and China and the ensuing fears of disruptions in supply lines underline the geopolitical risks embedded in the reliance on critical foreign minerals. The global scenarios have brought forth the importance of critical minerals in defence sectors worldwide[5], signalling warnings for countries like India.

The Indian Context: Defence Sector and Dependency on Critical Minerals

India, a developing global power, has steadily enhanced its defence capability to assert its strategic autonomy and safeguard national security. India's defence sector has seen a robust growth trajectory driven by advancements in missile technology and communications development[6]. However, this growth story has its fair share of challenges. Central to these is India's dependence on imports for critical minerals, a potential Achille's heel for its defence sector[7].

Several technologies critical to India's defence ecosystem rely on the stable supply of certain minerals. Whether it is the use of REEs in the production of navigational systems in Indian missiles or the use of lithium batteries in various equipment, the need is substantial and varied. Yet, India's domestic production of these minerals remains scanty, forcing heavy reliance on imports from other countries like China[8].

The coupling of a growing defence industry and a persistent mineral import dependence, thus, cast a long shadow over India's ambitions. This complex landscape necessitates a deep dive into the particularities of India's critical mineral demand and supply equation.

India's Domestic Production: The Current Stage

India's domestic production of critical minerals is far from sufficient[9]. The reasons behind this situation are manifold. Primarily, it has resulted from inadequate exploration, lack of investment in mining and processing infrastructure, and regulatory constraints. The rich mineral potential of the country largely remains untapped, resulting in a supply-demand imbalance.

For instance, India has enormous reserves of Bauxite, a mineral crucial to produce aluminium with several defence applications. However, the country's capability and capacity to make has not seen much growth due to many environmental concerns and regulatory hurdles[10]. On the other hand, India has recently found vast reserves of Lithium within Jammu & Kashmir, and Rajasthan[11]. This will reduce India's import dependence, but many regulatory hurdles must still be overcome. The country's reserve of critical minerals like Cobalt and REEs is negligible and compels India to rely heavily on imports to meet domestic demands[12].

The gap between the demand and production of critical minerals has pushed India into the hands of foreign suppliers. Imports are the mainstay of India's critical mineral supply chain, and the over-reliance on foreign sources harbours

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China surfaces prominently in this discussion. Being the largest producer of REEs in the world, China fulfils a significant portion of India's REEs requirements. A similar situation persists for minerals like Lithium and Cobalt that are essential for the burgeoning electric vehicle (EV) and electronic industries.[14] This skewed import profile has placed India in a precarious position as a significant portion of India's defence sector depends on foreign sources. This puts India in a vulnerable position regarding supply chain disruptions that could emanate from geopolitical tensions, trade disputes, and other unexpected global events.

Regulatory Policies and Strategies: India's Current Approach

Given the critical minerals' role in India's defence sector, it becomes crucial to go through the regulatory framework and strategies to secure these essential mineral resources. In the past few years, the Government of India (GoI) has shown awareness regarding resource security through some policy initiatives. A necessary move in this direction was the formulation of the National Mineral Policy in 2019.[15] The main objective of the policy is to attract private investors and foreign direct investment (FDI) for the exploration and mining of minerals. The approach emphasises sustainable mining by focusing on the welfare of mining-affected areas and people.

Moreover, to secure reliable supplies of these minerals, the GoI is forming strategic international partnerships with countries like Australia and Japan to diversify its import sources and, thus, reduce its reliance on China.[16] However, these initiatives are initial steps on a long path towards achieving comprehensive resource security. There is a real need for a more focused approach to address the complexities surrounding India's critical mineral requirements.

Enhancing Domestic Capabilities: Research and Development

Meeting critical mineral requirements is an indispensable facet of resource security, and for India to do so, it must strengthen its existing domestic

capabilities. This requires a twofold approach; bolstering research and development (R&D) efforts and expanding the infrastructure for the mining and processing of minerals. Investing in R&D can unlock new technologies for extracting, processing, and recycling minerals, reducing reliance on foreign sources. It also opens avenues for discovering potential substitutes for certain critical minerals, mitigating the risks associated with their scarcity.

Institutions like the Atomic Minerals Directorate for Exploration and Research (AMD) have been actively involved in lithium exploration in India.[17] Likewise, the GoI has established a facility to produce rare earth magnets. The facility belongs to Indian Rare Earth Ltd and uses an indigenous reduction-diffusion technology (created by Bhabha Atomic Research Centre) to make rare earth permanent magnets and magnets.[18] Facilities like these could be a model for exploring other areas of critical minerals and simultaneously developing technologies for producing key components for the defence sector. Similarly, investment in mining infrastructure can tap into the country's rich mineral deposits, propelling production to meet the demands. This approach must be balanced by considering environmental concerns and ensuring sustainable extraction practices are followed.

Involving the private sector in India's quest for resource security can be a game-changer. Given the dynamic nature of the industry and the need to innovate, the private sector can play a prominent role in exploring, extracting, and processing critical minerals. Moreover, it can bridge the investment gap in the mining industry, uplift the existing infrastructure, and bring forth the necessary technological advancements. Recognising the hidden potential of the private sector, the GoI has opened the door for greater private participation in the mining industry through its various policies and schemes. However, creating a favourable and participative business environment is vital to harness the potential fully. This means addressing issues like red tape and delays in obtaining clearance and providing necessary incentives to encourage investment in R&D.

Strategic Stockpiling and Diversification of Sources: Essential Tools for Resource Security

Strategic stockpiling effectively mitigates the risks associated with critical mineral shortages and supply chain disruptions by building and maintaining reserves of critical minerals. Countries like the USA and Japan signed a "Critical Minerals Agreement" to secure their supply[19] and promote stockpiling. In the case of

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India, there is a pressing need to consider this approach as the country depends heavily on imports for these resources. There is a need for a comprehensive stockpiling strategy. To do so, it is vital to identify the minerals most critical to the country's defence sector and for which the supply risk is the highest.

Such a strategy requires substantial investment, concise planning, and a robust management system. Despite these challenges, strategic stockpiling can serve as an insurance policy in case of supply chain disruptions and, thus, enhance India's resource security. And yet, stockpiling alone will not suffice as India, to maintain resource security of these critical minerals, will also have to expand its sourcing network.

Diversifying import sources through international partnerships is vital to achieving resource security. By doing so, India can mitigate the risks associated with overdependence on a single supplier and, thus, enhance the resilience of its supply chains. In recent years, India has forged partnerships with various countries in the Indo-Pacific. For instance, India has a supply agreement with Australia for the latter to supply critical minerals to fuel India's developing energy economy.[20] Similarly, India is looking to explore the seabed of the Indian Ocean for the extraction and processing of essential minerals, thereby diversifying its sourcing.[21] In 2014, India and Japan signed an agreement to explore and produce rare earths.[22] Though such efforts are promising, they must be intensified and expanded on. Building on such partnerships with countries rich in mineral resources, both in the neighbourhood and beyond, could prove beneficial.

Navigating Geopolitics: Challenges and Opportunities

The quest for resource security is not only concerned with domestic policies or market dynamics; it is deeply intertwined with geopolitics. Given their strategic significance, critical minerals are crucial to international power dynamics and rivalries. Thus, navigating the geopolitical landscape is a prerequisite for securing these vital resources. This means forging alliances and partnerships around mutual benefits and interests for India. Engaging in collaborative ventures to explore, extract, and process critical minerals could be a win-win solution for all those involved.

However, such ventures bring forth their own set of challenges. They involve the navigation of complex issues about sovereignty, territorial disputes, ecological concerns, and the rights of the local populace. Countries rich in critical mineral resources are situated in the Indo-Pacific, and regional geopolitics add further complexity to the situation. Yet, despite the challenges present, geopolitics also brings many opportunities. By aligning its critical mineral strategy with its diplomatic outreach and foreign policy outcomes, India can turn resource scarcity into a tool for diplomacy, fostering more robust relations with its international partners.

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The Path Ahead: A Call to Action

Though the strategies mentioned above provide a roadmap for achieving resource security, their success ultimately strives for the practical implementation of policies. In the case of India, this involves transforming strategy into actionable policies and programs. Creating a favourable regulatory framework to attract private investment, initiating R&D for technological advancements, establishing strategic reserves, and strengthening international collaboration are vital components of this roadmap. However, each of these requires careful planning, allocation of resources, and robust monitoring mechanisms to ensure that they deliver the desired outcomes.

For instance, attracting private investment in mining will require addressing bureaucratic hurdles and creating a transparent regulatory system. Similarly, establishing strategic reserves will require a careful assessment of the minerals critical to India's defence sector, substantial financial investment, and a robust storage and management system. The path to resource security is challenging and fraught with complexities. Yet, it is a journey India must undertake, given the strategic importance of critical minerals to its defence sector. The challenges of securing essential minerals for India's defence sector are profound but not insurmountable. With strategic planning, sustained efforts, and the collective will of government, industry, and society, India can strive towards achieving resource security.

Conclusion

Securing critical minerals for India's defence sector is about ensuring resource availability and safeguarding national security through economic resilience and propelling India's emergence as a technological powerhouse. The government will play a pivotal role in formulating policies that will foster a conducive environment for the involvement of the private sector, development of R&D, and promotion of sustainable mining practices. On the other hand, the industrial sector in India needs to align its strategies with national objectives, invest in innovation, and adhere to responsible mining practices. Moreover, international partnerships and collaborations will be crucial in diversifying India's sourcing, mitigating supply chain risks, and gaining access to advanced technologies. Such partnerships, however, need to be rooted in a clear understanding of the geopolitics of critical minerals and informed by India's broader foreign policy objectives. The journey towards resource security has begun, and there is no turning back.

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SECTION III

TECHNOLOGY, CAPABILITIES AND WEAPON SYSTEMS

CENTRE FOR LAND WARFARE STUDIES

Innovation Driven Technology Development

S GURUPRASAD

Abstract

The development of new technologies involves significant analytical skills with experimental research over a long time. Here, innovations play a very important role in the success of an engineering system design and development project. The technology development stands on three pillars, scientific principles and effects, laboratory-level technology demonstration and then deep experimental research and maturity of the technology and its application in complex engineering systems. There are many aspects during the design process that cannot be clearly quantified but the involvement of users (Armed Forces) in the design process can lead to an optimal system design.

Introduction

Any Engineering System will need an initial simplified mathematical model which in turn will need an initial set of design parameters that sufficiently represent the system. In other words, any creative design concept of a system will need a simplified mathematical model that can be used to establish the scientific feasibility of building such a system before investing in detailed design and analysis. Once the initial investigations yield positive results then efforts to build complex analytical models and computer simulations can be carried out to further arrive at a preliminary design of the system. Design and Analysis is an iterative process until the Design Team is fully satisfied and confident about the success of the system after realisation. This article examines how various skill sets

are used in conjunction with innovativeness to design and field the required technology. For innovation, the involvement of the users is paramount as, especially in defence technology the scientist may not be able to visualise the requirement in totality and the user may not be able to visualise the technological constraints.

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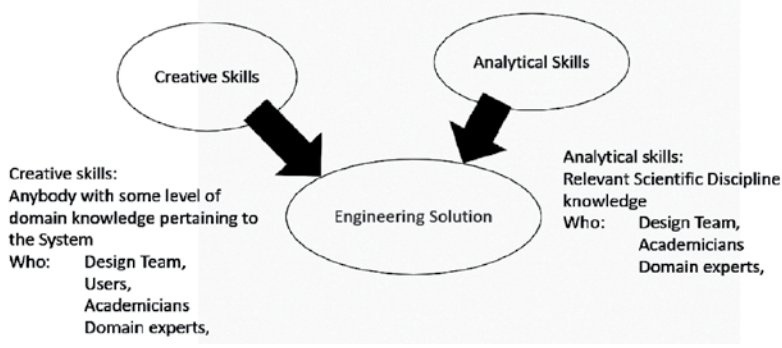
Technology Design and Development Process

Technology Development and Engineering Design & Analysis will need creative skills as well as analytical skills. Unlike Science, wherein the cause and effect are definitive and fit a scientific theory, engineering problems can be solved by a multitude of designs even when using the same scientific principles. This is because of choices and options of using different materials, mechanisms geometrical forms, etc. The initial conceptual design with initial design parameters with form and size is the starting point. For example, a bridge must withstand the live load and its own self-weight, hence, a first approximation design is essential to calculate the Self-Weight and with further iterations and detailing the Design-Analysis loop converges to a satisfactory level. The iterative process will also involve the selection of suitable technologies and materials that will lead to an optimal design that meets all the functional requirements of the system. Figure 1 shows the nature of an engineering solution wherein the design team contributes the most.

Figure 1



The quality of design is a direct result of the quality of the design team. The thoroughness of the mathematical modelling of a system and its simulation using computers is the most essential process for understanding of a complex engineering system before realisation. If the characteristics of a system is not fully represented in the analytical model, it may lead to failures during testing or use, the failure analyses of which will emerge as aspects not considered in the analytical model. It is very challenging to build a truly digital model of a system that involves complete physics of all the subsystems across different domains viz. structural, thermal, fluid dynamics and control engineering. Nevertheless, even if thorough analyses are carried out and the system is sufficiently characterised, it is difficult to say if all the possibilities and variations of operational conditions and design parameters are covered. A system better understood will evolve better during the design process which involves creative skills in combining different subsystems to skilfully enhance the system performance. In summary, analytical skills and creative intuitions are both deeply integrated in Technology Development and System Design and Development.

Science as Foundation of Technology Development

A deeper understanding of scientific principles and effects is essential to develop technologies and this pertains more to academic and research laboratories. Newer applications of scientific principles and effects and tailoring of newer materials that perform better than existing materials must be carried out at academic and research laboratories with dedicated teams of scientists with deep specialisation in related topics. Most of the breakthrough technology developments involve years of toil in laboratories with long gestation periods. Hence, academicians and academic institutes have to provide initial leads into theoretical basis and lab-level technology demonstration.

While the academic institutes can definitely provide a theoretical basis and initial studies it will be the job and efforts of the application domain experts to design and develop practical and deliverable level technologies. The research laboratories play a very important role in this stage between the academia and the industry, especially in the high-end defence technologies. It is prudent to mention that sustained years of research in narrow technology domains are required to lead to the successful delivery of technologies. The research threads in most of the areas are well known and will need a laboratory with sufficient

infrastructure with capable researchers in engagement with appropriate academic institutes to work towards well-defined objectives in a systematic manner with a benchmark of state of art in comparison to global standards. Advanced technologies involve experimental research and modern experimental research demands elaborate test facilities, instrumentation and infrastructure that appear not to be returning any noticeable output in the near future. System Development agencies tend to import alternate subsystems that are low-cost compared to ab initio development and meet the immediate requirements. However, systematic technology development needs long-term commitments that see beyond the development of a product and the development of one particular system. The retention of research talent needs not only a befitting pay package but also a research challenge with necessary finance and infrastructure. Return on investment in R&D is low in perception but without taking developmental risks, significant S&T achievements are not possible.

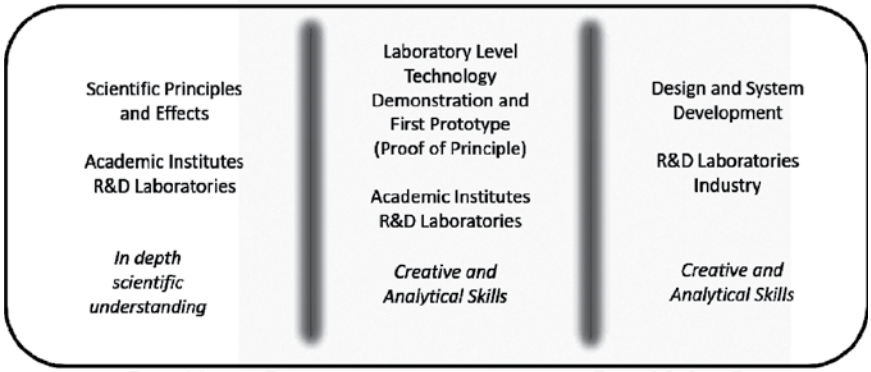
The retention of research talent needs not only a befitting pay package but also a research challenge with necessary finance and infrastructure. Return on investment in R&D is low in perception but without taking developmental risks, significant S&T achievements are not possible.

On the other hand, the manufacturing agencies and System Design and Development agencies have to provide Deliverable Engineering Systems that perform at least to the level of state of art. The application domain specialisation is another important aspect of system development, for example, metallurgy for underwater applications, noise reduction and cancellation technologies are very deep specialisations that need to be handled by the respective domain specialists. Hence, system development involves:

- Academic institutes that would give a theoretical basis and help in building a mathematical model of the system.
- Research laboratories wherein the technology is widely experimented.
- System Design and Development agency that realises the System and also integrates all the subsystems and an overall optimal design that is deliverable.

The above three Pillars of technology development and System Engineering have blurring boundaries and have to have an iterative approach before going for metal cutting.

Figure 2



Technology Development as a Performance Driver

It is important to clearly understand what we mean by Technology as different domains and different sections of people use the term Technology not with the same sense and meaning. Very commonly an Engineering System Design and Development project is also sometimes termed as technology development. Even a software development project is also termed as technology development. Ignoring the different flavours of understanding the meaning of technology development, it is easier to understand that underlying technology delivers the performance of the system. If a sensor array utilises a different material technology and delivers better performance and it is integrated with the rest of the system that would combinedly deliver better performance and its effective utilisation for the platform is enhanced, there is a significant technology developed.

Any complex and significant technology development wherein innovative and inventive steps are involved will face unforeseen technical challenges and setbacks and most of the time there will be time and cost overruns. Development of high-end platforms and systems have to have new technologies that would provide them the edge over the state of the art, hence, there will always be some level of uncertainties in these developments. In fact, without time and cost overrun, such a project would have produced a mediocre result without much significant achievement. This has been the experience of Technology and System Development the world over. Technology Development agencies are aware of uncertainties and unknowns they may encounter, and in anticipation plan for contingencies. There must be risk mitigation plans with alternate

subsystem development wherever there is a higher risk.

The Spiral Development methodology ensures continuous availability of the systems and also ensures continual performance enhancements as newer technologies get incorporated into the upgrades and newer versions of the systems. Spiral development is also essential as system lifecycles with software and hardware upgrades keep getting shorter. The Armed Forces must get used to faster upgrades and faster induction as technology obsolescence keeps getting shorter.

Adapting a new technology developed for an application will need innovative approaches and experimentation in an R&D environment developing related algorithms and optimal configurations before reaping the benefits.

Technology breakthroughs with disruptive effects come rarely and most of these are connected to the material sciences where newer materials for performance enhancements are pushing the R&D. The scientific journal articles give a glimpse of what is in wait for the future for defence technology. Most of these technologies initially appear to be difficult for practical applications. The Nano-materials,[1] GaN-based semiconductor devices,[2] Lithium based batteries, Spider silk,[3] Ultra High Molecular Weight Polymers[4] that are stronger than steel, and so many other technologies are examples of newer materials and technologies that have found applications in system development. The use of these new technologies in innovative ways has been done by designers and one such example is the use of GaN-based AESA radar for multibeam applications and also as a communication transceiver.[5] Whenever new technologies come in one domain, they also open up newer applications in many other domains. There is a lot of room for innovation in the application of newer technologies and pushing up the system performance. Adapting a new technology developed for an application will need innovative approaches and experimentation in an R&D environment developing related algorithms and optimal configurations before reaping the benefits.

Innovation as A Key Driver in System Development

The creative skills, intuitive and heuristic capabilities of the development team in the second and third stages of technology development are significant. Conceptualising the right combination of subsystems with appropriate technologies with aspects of performance, reliability, manufacturability, and

cost-effectiveness are often achieved after many years of toil. The difference between the recent Chandrayaan 2 and Chandrayaan 3 missions were in design, system configuration and operational logic taking care of the redundancies and failure modes. Technologically or in material technologies used probably there were no differences. This again proves the importance of creative skills, intuitive thinking and heuristic capabilities that come with experience. These skills are individualistic but can be developed by on-the-job training through apprenticeship. Technology development is organisational when teams work on similar projects repeatedly over a period of time and that becomes a knowledge repository that gets passed on from generation to generation. Technology development is not something that can be done overnight by just assembling a team but will have to be a long-term objective. The environment for technology development evolves when appropriate technology leaders, a capable team of researchers and the right infrastructure are put together and provided sufficient time. Wherever we see excellence in technology development, we can identify the decades of efforts in that domain and it is not difficult to pinpoint the key Technology Leaders of the domain.

The User Requirements. The user (Armed Forces) inputs and aspirations are extremely important and to get a global optimum design point it is essential that highly experienced users who have huge experience of using similar systems are part of the system design team. The users evolve a doctrine of operations based on the systems that are available to them, usually craving for more. The user perspectives especially the operational requirements, many of which are hard to quantify cannot be handled by theoreticians and analysts alone. There would be many subjective issues in the design phase that are hard to put in a mathematical model to get a close-loop solution. These issues have to be judiciously converted into objective parameters with deliberations. In this phase of system development understanding of conflicting requirements and the use of proper analytical tools to take proper design decisions are essential. When a technological breakthrough happens, that will allow the users to reframe the operational requirements for the new system that would be available.

The Operational Requirements have to be converted into a clearer definition of System Requirements with quantification which will further need to be converted into engineering specifications for the overall system and for each subsystem. When preliminary analytical models are built, it would be discovered

that many performance parameters as desired may not be met in all the operational conditions and hence there will be a need to either redesign the system or to reconcile such that the system is nearer to an optimal configuration. The development of high-end platforms, sensors and weapon systems cannot be fully driven by System Requirements in a very strict manner, nor it can be too flexible, there would be a number of revisits to System Requirements and the engineering design and specifications would be further revised. The efforts need to be with reference to a global benchmark wherein the development will be driven by essential functional requirements and optimal system design to finally arrive at whatever the best that can done for a given situation or operational environment.

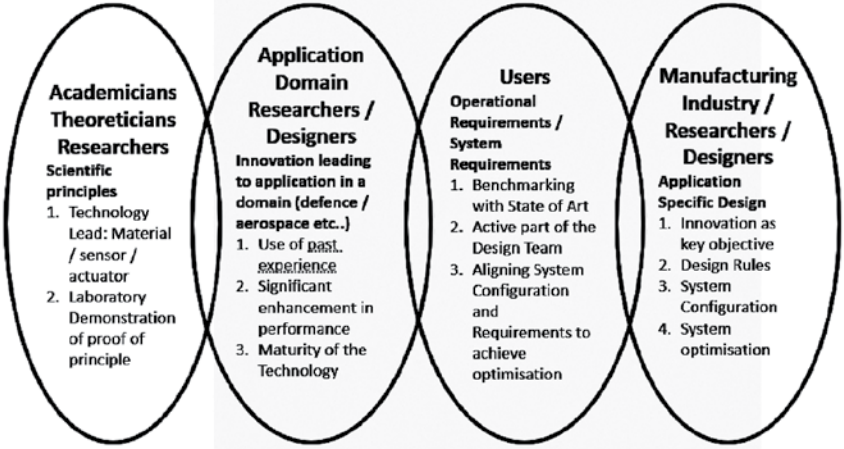
The development of high-end platforms, sensors and weapon systems cannot be fully driven by System Requirements in a very strict manner, nor it can be too flexible.

It is also worth noting that the gestation period of many technologies exceeds the requirement timelines of systems with setbacks in related technology development due to yet-to-mature conceptual design or manufacturing processes. The availability of second-tier development agencies and industries who can be outsourced for subsystem development would be a great strength and advantage to the System Developer. It is to be appreciated that such an R&D industry environment can only evolve over a long period of time with a sustained and continual series of system development projects.

The System Design and Development to produce a very successful system has to have a number of innovations with many first-of-kind approaches. If there are no innovations, it is guaranteed that a mediocre product would result. Even when the input technologies that go into subsystems would not be new, it is possible to enhance the system performance by innovative configuration, and innovative algorithms in system operation. Most of the successful complex systems can be traced to significant innovations in achieving a global optimal design point. Newer technologies that very clearly give better performance as well as newer materials, give clear advantages to the design team to design a better system but ingenuity to hit a sweet spot in the design space entirely hinges on the creative skills of the design team.

Figure 3 illustrates the major stakeholders and their roles and responsibilities briefly. It is hard to capture a complete technology development environment in a nutshell.

Figure 3



Conclusion

Technology Development is a complex process and needs long-term R&D planning with the necessary infrastructure with capable human resources. There needs to be a structured approach in establishing the nexus of academia with dedicated research laboratories wherein technology development teams work on a long-term basis, and it must be ensured that there are no huge technology gaps from the state of the art. The research laboratories should have a network of academicians and researchers with deep specialisation in the connected disciplines. There must be a long-term engagement with academic institutes for academic research support to the research laboratories while it engages in experimental research and building prototypes focussing on innovations to maximise system performance.

System Design Teams must have experienced users as part of the team who can modulate and optimise the System Requirements to lead to an optimal design. The focus should be on what best can be done with the available technologies and with best of available resources. Spiral development methodology should be adapted in all high-end technology development projects.

Innovations should be a key objective in system development, creative solutions should be given utmost importance and no idea should be disregarded based on gut feelings unless proven infeasible by a mathematical model. Development of state of art Technology Development needs a deeper understanding of scientific principles & effects and analytical skills. It requires

state of art research infrastructure with qualified researchers and innovative design solutions for components, subsystems and the entire system. The design teams have to focus on innovation and most importantly, the complete involvement of users in the development team will be key to success.

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Notes

1. Nanomaterials are materials possessing, at minimum, one external dimension measuring 1-100nm. They are used in various industries. In aerospace, they are used in the morphing of aircraft wings. In the military among the many uses are to produce camouflage, through injection of the particles into the material of soldiers' uniforms. Additionally, the military have developed sensor systems using nanomaterials, that can detect biological agents. *TWI*. What is a Nanomaterial? - Definition, Examples and Uses - TWI (twi-global.com), accessed on September 12, 2023.
2. GaN (Gallium Nitride) is used in the production of semiconductor power devices as well as RF components and light-emitting diodes (LEDs). Power devices based on GaN significantly outperform silicon-based devices. *EPC*. What is Gallium Nitride (GaN)? GaN Semiconductors Explained | EPC (epc-co.com), accessed on September 12, 2023.
3. Pound for pound, spider silk is stronger than steel and tougher than Kevlar. Also see, Kathreen J Wu, "Spider Silk Is Stronger Than Steel. It Also Assembles Itself", *New York Times*, November 4, 2020, Spider Silk Is Stronger Than Steel. It Also Assembles Itself. The New York Times (nytimes.com), accessed on September 12, 2023.
4. With Very high strength and very low density it is the material used in the medical field in total joint replacements and in defence applications for personal armour and vehicle armour.
5. To read more on this see Joao Pedroso "High-Performance Radar Systems Based on GaN Technology", PSD, January 4, 2021. https://www.powersystemsdesign.com/articles/high-performance-radar-systems-based-on-gan-technology/138/17644, accessed on September 12, 2023.

Cyber Capabilities for the Indian Army as Part of Multi-Domain Operations

AJEET BAJPAI

Abstract

Operations in cyberspace offer a high degree of asymmetry in a multi-domain and interconnected battlespace. Therefore, the Indian Army needs to develop potent capabilities to defend, exploit and dominate cyberspace. 'Cyber Defence' hinges on a combination of well-defined processes, emerging technologies, awareness amongst people and robust cyber security strategy. Exploiting cyberspace encompasses 'Cyber Intelligence' to anticipate potential threats, 'Cyber Deception' to mislead the adversary and 'Cyber Influence Operations' to control the narrative, shape perceptions and disrupt his decision-making. 'Cyber Diplomacy' and 'Cyber Deterrence' are two key pillars of dominating cyberspace which is orchestrated at the national level and aimed at thwarting external interference or influence by the adversary.

Introduction

Multi-Domain Operations (MDO) envision integrated and synchronised operations across multiple domains of warfare comprising Land, Air, Sea, Space, electromagnetic spectrum and Cyber to achieve battle space dominance and superiority in complex and dynamic operational environments.

MDO entails evolving an operational process that provides a common operating picture across domains augmented by an advanced Decision Support System to accomplish strategic objectives and disrupt the adversary's cohesion and Observe, Orient, Decide, Act (OODA) Loop. It presupposes the following:

MDO entails evolving an operational process that provides a common operating picture across domains augmented by an advanced Decision Support System to accomplish strategic objectives and disrupt the adversary's cohesion and Observe, Orient, Decide, Act (OODA) Loop.

- Advanced Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) capabilities for identifying and understanding potential threats across different domains.
- The high degree of collaboration between a multitude of stakeholders to enhance situational awareness and have a better understanding of the vulnerabilities which can be exploited for gaining operational ascendency over the adversary in time and space.
- Failsafe and robust Information Systems Architecture that supports seamless exchange of information between Sensors (regardless of their platform), Shooters (regardless of their domain) and Decision Makers (regardless of their location).[1]

While conventional conflicts in the domains of land, sea, air and space require decisive combat superiority at the point of application, operations in cyberspace afford a high degree of asymmetry. Access to actionable information and selective denial of the same to the adversary is critical to gain ascendency in a multi-domain and interconnected battlespace. Thus, operations in cyberspace play a critical role in MDO. It is imperative for India to have potent capabilities to defend, exploit and dominate cyberspace.

Defending the Cyberspace

Recent attacks on cyber infrastructure across the world demonstrate the destructive power of the present crop of cyber threat vectors. For the Indian Army, defending cyberspace would primarily entail developing the capability to protect its information systems and networks and safeguard its sensitive

information and digital assets from various Advanced Persistent Threats (APT) and cyber-attacks.

While the cyber threats cannot be eliminated completely, the bedrock of an effective cyber defence is to establish a robust eco-system, imbibe innovations in technology to secure cyberspace and evolve a comprehensive, bold and proactive cybersecurity strategy.

There is an old quote by the brilliant strategist, Fredrick the Great of Prussia, "[h]e who defends everything, defends nothing".[2] In conventional battle, every defender understands the significance of Vulnerable Area, Vulnerable Point (VA/VP), Ground of Tactical Importance (GTI), Defended Locality et al. The defences are planned, sited/organised and defended accordingly. A similar analogy can be extended to cyberspace. First and foremost, the Indian Army should assess and identify the Information Systems infrastructure which are critical and need to be protected at all cost.

Risk Assessment

One of the aims of the adversary would be to try and gain ascendancy in the cyber domain by targeting and compromising the Indian Army's C4ISR Systems. Thus, it is imperative to carry out a quantified assessment of risk to the likely targets, enumerated as under:

- Identify the likely threats and the escalatory level to which they can be employed. Threats are not only external. In reality, internal threats (attributed to negligent, compromised or malicious insiders) account for over 65 per cent of the breaches.
- Assess the known vulnerabilities (both internal and external) and the likelihood of their exploitation by the adversary.
- Analyse the impact of numerous potentially debilitating scenarios on operational effectiveness.

Risk is a function of threat, vulnerability and impact. The quantified risk score not only gives an objective assessment of the 'Cost of Protection' vis-à-vis 'Value of Critical Information Assets', but also aids in enhancing Cyber Resilience.

Cyber Resilience

The Information Assets that need to be protected would always exceed the resources required to safeguard them. Moreover, new 'Zero-Days'[3] will continue to be discovered and exploited by the adversary. The notion of impregnable

cyber defence is utopian. The Indian Army needs to work on the premise that the first line of cyber defence would invariably be breached.

In such a backdrop, Cyber Resilience assumes great importance for the Indian Army to maintain ascendency in the cyber domain. The road map entails defining the security objectives, and outlining the framework broadly based on the following principles:

The long-term strategic goal of the Indian Army should be aimed at multi-layered security of cyberspace comprising a combination of well-defined policies, institutionalised processes / best practices, adoption of emerging technologies and inculcating awareness amongst people managing the cyber domain.

- Security should be inherent in the design rather than imposed as an afterthought and overlay.
- Legacy systems need to be retro-secured, upgraded or replaced, where necessary.
- Real-time monitoring of critical information systems using advanced technologies like 'Anomaly Detection', 'Behaviour Analytics', Predictive Modelling' *et al* to detect and block potential cyber threats.
- Formulation of robust Incident Response, Disaster Recovery, Crisis Management and Operational Continuity plans. These need to be practised, reinforced, reviewed and improved continuously.
- Simulated cyber-attacks on own Information Systems to identify weaknesses and vulnerabilities. The success of U.S. DoD's 'Hack the Pentagon', 'Hack the Army' and 'Hack the Air Force' initiatives,[4] which led to the discovery of several vulnerabilities, is a case in point.

The long-term strategic goal of the Indian Army should be aimed at multi-layered security of cyberspace comprising a combination of well-defined policies, institutionalised processes/best practices, adoption of emerging technologies and inculcating awareness amongst people managing the cyber domain. This will reduce the gap between existing and desired operational capabilities.

Myth of the Air-Gapped Systems

Air-gapped systems often instil a false sense of security because of the misplaced belief that they are inherently safe. While they do increase the degree of difficulty for the adversary, there are numerous instances where air-gapped networks

have been breached. The Stuxnet attack on Iranian nuclear facilities remains a classical case study.[5]

Over the years, various creative and esoteric means of jumping air-gapped systems have been demonstrated. The 'Ramsay Framework' and exploitation of 'Air-Gap Covert Channels' through electromagnetic waves, near field communication (NFC) technology, acoustics, optical signals, thermal signatures, power lines and compromised supply chain are now a part of cyber-espionage folklore.[6]

Exploiting the Cyberspace

Exploiting cyberspace encompasses acquiring 'Cyber Intelligence', undertaking 'Cyber Deception' and carrying out 'Cyber Influence Operations'.

Cyber Intelligence

> *"If you know neither the enemy nor yourself, you will succumb in every battle. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know the enemy and know yourself, you need not fear the result of a hundred battles".*
>
> —Sun Tzu (probably 512 BCE)

As the above quote shows, gathering intelligence and staying informed about the adversary has been a practice since time immemorial. The vast amount of strategic and sensitive information, hitherto kept in physical form under heavy security, now resides as a digital repository in cyberspace. More often than not, this information is required to be shared quickly and seamlessly across all other domains making it susceptible to being compromised.

Cyber Intelligence is critical for gaining a comprehensive understanding of an adversary's capabilities (including vulnerabilities and details of ongoing research and development) and intention (political, military, economic or technological activities). It is also essential for target identification (specific enemy assets and potential targets) and finally for gaining information superiority. Cyber Intelligence is invaluable to anticipate potential threats and plan appropriate responses. The Indian Amy needs to invest heavily and build potent capability in Cyber Intelligence. If orchestrated effectively, it can be an 'Instrument of Power' having far-reaching implications for National Security.

Cyber Deception

Cyber Deception is a deliberate and controlled act primarily aimed at deceiving the adversary by deploying several traps and decoys across its own information system infrastructure, misdirecting his efforts in terms of time and resources and misleading his perceptions and decision processes. As a spin-off, it can hugely augment the efforts to garner Threat Intelligence by analysing the adversary's Tactics, Techniques and Procedures (TTPs) and producing the metrics surrounding the indicators of compromise.[7]

Cyber Deception techniques and technologies have come a long way since the early days of rudimentary Honeypots.[8] A variety of commercial and open-source options are now easily available. The Indian Army would need to customise these based on its own goals and objectives and the adversary's TTPs.

Successful cyber deception plans hinge not only on technology but also on social engineering and psychology. It is an art which, if executed with a high level of ingenuity and innovation, can create asymmetry by altering the adversary's perception of reality and gaining attributions to discern his strategy.

Cyber Influence Operations

Cyber Influence Operations can be considered as yet another vector for furthering own strategic interests by targeting the Cognitive Domain. It leverages psychological, informational and social tools to control the narrative, shape perceptions and disrupt decision-making to gain ascendency over the adversaries.

An article in the Indian Express e-Paper dated 14 September 2020 titled 'China is Watching' claimed that the Chinese had created an Overseas Key Information Database (OKIDB) by mining information of over 2.5 million prominent personalities from India, UK, USA, Japan, Canada and other countries. The database also tracked near real-time movement of warships, naval vessels, satellites and defence assets of several countries based on information retrieved from cyberspace.

It was further revealed that OKIDB contained names of thousands of influential Indians including very senior officers of the Armed Forces, Ministers, Legislators, serving and former Prime Ministers, Governors, Chief Ministers and their families, bureaucrats in key positions, judges, scientists, academicians, journalists, religious influencers and activists. Even several personalities accused of financial crime, corruption, smuggling and terrorism were listed in the OKIDB.

It is inescapable for the Indian Army to develop effective structures for Cyber Intelligence, Cyber Deception and Cyber Influence Operations. There is no gainsaying that 'Exploiting the Cyberspace' is an efficacious precursor to 'Dominating the Cyberspace'.

It would be reasonable to surmise that the data collected by the Chinese on India can be (mis)used to peddle antagonistic strategic narratives, reduce the confidence of the people in their governments, confuse societal discourses, widen socio-political divisions and create seeds of self-doubt within the Indian state.

In yet another case, on 7-8 August 2023, leading newspapers, print and electronic media across the globe reported details of an investigation by the New York Times which blew the lid off a sophisticated Chinese 'Influence Operation' which has serious security ramifications for India. A propaganda network, based in Shanghai, was reportedly funding NGOs, Think Tanks, Media Websites globally (including in India) to push the narrative of the Communist Party of China.

These disclosures indicate the scope and depth of the Chinese Government's investment and capabilities in 'Intelligence' and 'Influence Operations' using cyberspace. This is in line with Sun Tzu's 'Art of War' strategy which propounds that "Supreme excellence consists of breaking the enemy's resistance without fighting".

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Dominating the Cyberspace

Two key pillars of Dominating the Cyberspace are 'Cyber Diplomacy' and 'Cyber Deterrence'. Both are orchestrated at the National Level where all arms of the State play their designated role. On its part, the Indian Army needs to augment the national effort by developing appropriate structures aimed at thwarting external interference or influence by the adversary.

Cyber Diplomacy

Cyber Diplomacy entails formulating a strategy for engagement with foreign governments on international norms related to responsible state behaviour

in cyberspace and placing effective curbs on the activities of non-state actors. Diplomatic engagement on matters of cyberspace should be an integral part of foreign policy weaved around two primary considerations:

- India's geopolitical relation with the select country and the likely level of threat on account of that country's infrastructure being used, either directly or by any other threat actor(s), to target India.
- Cyber prowess of the select country, quantified based on globally accepted parameters.

Using the Global Cyber Security Index published by The International Telecommunication Union (ITU) as the reference, India's neighbours, allies and adversaries can be broadly divided into nine categories as depicted in Figure 1. This categorisation is not comprehensive but only indicative of the methodology of how countries can be bracketed for the purpose of Cyber Diplomacy.

Figure 1: Cyber Diplomacy Matrix

Geo-Political Relations with India & Likely Cyber Threat				
	Tenuous *(High likelihood)*	North Korea *(Lazarus APT Group targeting Indian Infrastructure)*	Pakistan *(APT 36 targeting Defence and Govt Networks)*	China (More than a dozen APT Groups operating out of PRC)
	Neutral *(Threat unlikely)*	Myanmar *(Member of BIMSTEC)* Afghanistan *(Cyberspace is used primarily for Social Media)*	New Zealand *(Five Eyes Alliance Member)* Thailand *(Member of BIMSTEC)*	USA, Russia *(Country's cyber infrastructure is often used by Threat Actors. Formal dialogues are ongoing)* Canada, Australia *(Five Eyes Alliance Member)*
	Ally *(No Threat)*	Mongolia, Bhutan, Nepal *(Assistance by India in Cyber Infrastructure & Training)*	Bangladesh, Sri Lanka *(Member of BIMSTEC)*	UK, Israel, France, Singapore, Japan *(MOU / Dialogue for partnership /collaboration on cybersecurity)*
		Basic	**Medium**	**Advanced**
		Country's Cyber Capability		

The Cyber Diplomacy Matrix can assist in furthering multilateral agreements with allies and neutral countries to elicit cooperation on cyber norms, concur on responsible state behaviour in cyberspace, open alternate Track 2 channels and

Deterrence can work only if India can convincingly project that she has the technological wherewithal and political will to respond appropriately to any belligerence by the adversary.

impose effective curbs on activities of non-state actors.

Existing alliances like Five Eyes, BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation), Quad (Quadrilateral Security Dialogue), Meridian Process (a global initiative of around 100 countries for Govt-to-Govt cooperation on Critical Information Infrastructure Protection) need to be leveraged. Further, co-opting selected private sector entities, NGOs and Think Tanks for limited engagement needs serious consideration.

Cyber Deterrence

Cyber Deterrence plays a significant role in deterring and disrupting the adversary's design of using cyberspace to his advantage. The adversary's incentive to initiate a cyber-attack is inversely proportional to the resilience of our cyberspace. The best dissuasion is for the adversary to believe that the cost of a cyber-attack against India, in terms of time, effort and resources would far outweigh the payoffs.

Deterrence can work only if India can convincingly project that she has the technological wherewithal and political will to respond appropriately to any belligerence by the adversary. If the adversary perceives that there exists a cogent risk of retaliatory cyber-attack on his C4ISR systems, logistics, warfighting assets, critical infrastructure etc, it is likely to dissuade him from any major cyber misadventure against India.

Threat of retaliation may not always suffice against a highly cyber-adept adversary. Options to counter such adversary would then largely rely on leveraging close geo-political and diplomatic ties with allies, international organizations and multilateral forums as a counterpoise. Cyber Deterrence can be considered a 'Mind Game' played in the 'Cognitive Domain'.

Conclusion

MDO require a high degree of synergy among multiple domains of warfare to leverage the strengths of each domain to compensate for the weaknesses of other, if any. Cyberspace operations not only play a pivotal role in achieving this synergy but can also significantly contribute to controlling the conflict escalation across multiple domains.

Cyber threats cannot be eliminated completely. The Indian Army needs to harden its C4ISR Systems by embracing emerging technologies, adopting robust processes and implementing strategies which will raise the cost of belligerence by an adversary prohibitively high.

Responding to threats from the non-state actors (both rogue and covertly supported by a state) remains a challenge. For non-state actors, neither diplomacy nor deterrence has any relevance. In future, the increasing use of non-state actors as proxies to blur and befog the combat zone may become a norm. Prudence lies in adapting to the emerging and unforeseen security challenges of cyberspace dynamically and reducing the risks significantly by developing the acumen to 'Foresee' the trends, 'Wargame' the options and calibrate the 'Responses'.

Major General (Dr.) **Ajeet Bajpai** (Retd) is a former Director General of NCIIPC, the National Nodal Agency for Protection of Critical Information Infrastructure. Views expressed are personal.

Notes

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2. *Goodreads*. https://www.goodreads.com/quotes/606161-he-who-defends-everything-defends-nothing, accessed on September 5, 2023.
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4. Hackerone, "Hack the Pentagon", https://www.hackerone.com/hack-the-pentagon, accessed on September 5, 2023.
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7. Kirk T. Andrews, "Deception Techniques and Technologies in the Role of Active Cyber Defense", Utica College, 2020. *Masters Thesis*.

8. A honeypot is a security mechanism that creates a virtual trap to lure attackers. An intentionally compromised computer system allows attackers to exploit vulnerabilities so you can study them to improve your security policies. *Imperva*, https://www.imperva.com/learn/application-security/honeypot-honeynet/#:~:text=A%20honeypot%20is%20a%20security,to%20improve%20your%20security%20policies, accessed on September 5, 2023.

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Indigenisation of Assault Rifles and Artillery Guns: Necessity of Good Standards for Developing Niche Products

R CHANDRASHEKHAR

Abstract

Indigenisation in defence equipment was an issue which was understood by the top most echelons in our country very soon after independence as an imperative for being able to both defend the country and maintain India's policy of non-alignment. Unfortunately, due to a variety of organisational and legacy issues, indigenisation proceeded very slowly. Even good and relatively low-technology arms like assault rifles and artillery guns have not been manufactured in India to world standards. The article examines this issue from the inception of defence manufacturing in independent India, the various organisations involved in indigenisation, and the impediments to indigenisation. It finally comes to the present state where slowly but surely progress in this critical sphere is being made.

In the initial quest for indigenisation though the imperative was understood, but for a variety of reasons progress was slow.

Introduction

Indigenisation, be it for military equipment or otherwise, has two cardinal objectives—create capability to "develop and produce equipment within the country for the purpose of achieving self-reliance" and "reduce the burden of imports".[1] In the initial quest for indigenisation though the imperative was understood, but for a variety of reasons progress was slow. In 1956 the then Prime Minister, Jawaharlal Nehru, speaking during a debate on 'Demands of the Ministry of Defence' in the Lok Sabha emphasised:

> [T]he more technical armies and navies and air forces get, the more important becomes the industrial and technological base of the country. You may import a machine or an aircraft or some other highly technical weapon and you may even teach somebody to use it, but that is a very superficial type of defence because you have not got the technological background for it. If spare parts go wrong, your whole machine is useless. If somebody from whom you bought it refuses to supply a part of it, it becomes useless […].[2]

He finished by stating that a country which is not self-reliant for its national security upon others remains 'dependent' and cannot be called 'independent'.[3] From the above quote, it is evident that the imperative for indigenisation was realised very early on after independence at the highest echelon.

Early Focus on Technology

The policy framework adopted in the follow-up had four clear prongs:

- Import-substitution.
- Development of local capacities.
- Industrialisation.
- Establishment of 'high quality' laboratories in the public sector.

The Council of Scientific and Industrial Research (CSIR) was set up as the apex R&D agency along with other mission-oriented agencies—the Department of Atomic Energy (DAE); the Indian Council of Agricultural Research (ICAR); the Indian Council of Medical Research (ICMR) and—relevant for the defence sector—the Defence Research and Development Organisation (DRDO). The

research areas for the DRDO included armaments, vehicles, clothing and general stores engineering equipment, electronics and radars, materials, naval research, aeronautics, food research, missiles and rockets, physical and chemical sciences and metallurgical research.

DRDO's Gun and Rifles Development Efforts

The early developments of the DRDO in the field of artillery and assault rifles (in collaboration with the Ordnance Factories) were the 106 mm recoilless gun; the L-70 anti-aircraft gun; the 7.62 mm family of self-loading semi-automatic rifles; carbines and light machine guns. All were by and large collaborative efforts with foreign manufacturers. This was followed by the 75 mm pack howitzer which was indigenously developed in all its components. Thereafter came the 5.56 mm family of small arms and the 105 mm Indian Field Gun.[4]

In 2013, DRDO undertook the development of the Advanced Towed Artillery Gun System (ATAGS). The Armament Research & Development Establishment (ARDE) Pashan was the 'lead agency' for its design and project was partnered with the Ordnance Factory Board (OFB) and, for the first time, two private corporate groups (Bharat Forge and Tata Power).[5]

Changing the Centrality of the DRDO

The DRDO, in essence, is an 'applied research organisation' that applies fundamental research (done at laboratories and institutions) to creating products for defence use. The well-known 'blame game' for why DRDO products fall short of being 'world class' is on account of the inability of the traditional 'Production Partners' (mainly OFB) to deliver quality products.

With defence manufacturing now being opened to private players, a sea change has occurred with competent techno-enabled production agencies who have the capability, culture and ethics to deliver the requisite 'world-class' products. The DRDO's role now has the added responsibility—to choose the right production partner for each specific product to be indigenised.

Ordnance Factories: The 'Departmental' Defence Production Base

Independent India inherited 16 Ordnance and Clothing factories.[6] These were essentially agencies to execute orders of products designed in the UK. Hence they did not have the capability for manufacture of new equipment post-independence. Also, on independence, an overwhelming number of engineering

and supervisory staff in these Ordnance Factories left India resulting in an acute shortage of skilled workers. The early initiatives to indigenise of production of artillery guns and assault rifles, the two areas of focus for this article, would require to be understood in this backdrop.

A rather common refrain in the corridors of South Block had for long been that the biggest killer of DRDO projects is delay. An equally grievous fault line in the functioning of that organisation has been its designs not matching user expectations and requirements. A well-known example being the INSAS Rifle which was fault-ridden and failed to invoke confidence amongst soldiers. A former DGMO had no qualms at all in referring to the weapon as a 'piece of metal'.[7,8] A recent 'success story' that merits mention is the truck-mounted gun system with a range of 40 km manufactured by the Gun Carriage Factory, Jabalpur that can fire multiple rounds in short duration. This was prominently featured at the Defence Expo, in 2018.[9]

Quality Assurance—The 'Drag' Factor

The third side of the 'Golden Triangle' of the Department of Defence Production (DDP) ecosystem is the Directorate General Quality Assurance (DGQA). Initially raised as 'Inspectorates' at Production Agencies (PAs) in 1869, the Directorate of Inspection was established under the MGOs Branch and Ministry of Industry & Supplies during WW II. In 1946, it became a part of the Directorate of Technology Development under MGO, prior to coming under the Controller General Defence Production (CGDP), MoD in 1955.[10]

The R&D and inspection functions were bifurcated, and two separate organisations were created—DRDO and Directorate General of Inspections, later redesignated as DGQA in 1968. The functions of QA, need little emphasis and include "regulation of the quality of raw materials, assemblies, products and components, services related to production and management, production and inspection processes".[11] This makes the DGQA an important player in indigenisation programmes.

A Longstanding Conflict of Interest. The DGQA presently functions under the Department of Defence Production (DDP), which incidentally is also responsible for OFBs and DPSUs. Several studies in the past have looked at the performance of the DGQA, including a performance audit of the DGQA by CAG in 2005 and importantly, the Lt Gen DB Shekatkar Committee in 2016. The latter in fact made a cardinal recommendation for the DGQA being removed from the control of the DDP and to be placed under HQ Integrated Defence

Staff (IDS). The Services have long been expressing reservations on the command and control of DGQA. Both the QA agency (DGQA) and the Production Agency (PA), being under the very same Department does have serious potential to compromise mandates. Further, the DGQA under DDP is an impediment to private industry seeking to offer quality products to the Armed Forces. Ironically, the latter, who are the eventual 'users' have no stake at all in the functioning of the DGQA.

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Same Item—Different Specs. An interesting observation of the Shekatkar Committee had been that though 'commonality of equipment between the Services exists in certain items, QA specifications for the very same item procured by the three Services are different'. The Committee also made critical observations on the quality of staffing of the DGQA and its continued 'inspection agency' functional ethos.

Slow Action on Defect Reports. Though it is the mandate of the DGQA to investigate 'defect reports' that are issued by users, the DGQA has seldom presented effective or cost-saving solutions. That a large number of DGQA functionaries have been associated with Ordnance Factories for 'Quality Control in the course of production' is self-speaking on how an archaic practice has lingered on though production parameters and technologies have both changed.

Third Party Inspection. The recent approval by the Hon'ble Raksha Mantri to bring "industry-friendly reform related to Authority Holding Sealed Particulars (AHSP)", especially of 'Third Party Inspection' is therefore a welcome development. This Scheme provides manufacturers 'the option to undertake inspection through Third Party agencies for non-critical defence stores manufactured by the private industry within India'.[12]

Recent Reforms in the DGQA. Some recent initiatives to improve the functioning of the DGQA have been the following:

- Mission Raksha Gyan Shakti aims at inculcating IP culture in the Indian defence manufacturing ecosystem and the Institution of an Intellectual Property Facilitation Cell (IPFC).[13]
- Defence Testing Infrastructure Scheme (DTIS) under which 6 to 8 state-of-the-art test facilities are set up by providing a Grant-in-Aid of Rs 400 Crores.[14]

- DGQA makes available proof ranges and laboratories to the private industry for carrying out dynamic proof trials and development activities at nominal costs.[15]
- Setting up a Self-Certification and Green Channel for qualifying Indian firms, which will cut down inspection timelines and costs.[16]

The Army's Artillery Rationalisation Programme (FARP)

The Indian Army's FARP was approved in 1999 as per which 169 Artillery Regiments were to be equipped with over 2,800 guns of 155 mm calibre by 2027. The programme, involved the acquisition of 1,580 towed, 100 self-propelled, 814 mounted and 145 ultra-light howitzers.[17] This saw little substantive progress for almost two decades. It was only as recently as 2018, with the induction of 145 × M777 A2 ULH and the 100 × K-9 Vajra tracked self-propelled guns, (both in the 155 mm/52 calibre class) followed closely by the approval to procure from the OFB 114 × Dhanush (an upgrade of BOFORS FH-77B)[18] that the FARP has moved forward.

Assault Rifles—In the Crosshairs of 'Adequacy and Effect'

The Indian Army presently uses a rather large variety of assault rifles—indigenous and imported. The latter include the AK-47, AK-74 (Sourced from Russia and Romania); the Israeli TAR-21 (Tavor), and the SIG Sauer 716, a modern assault rifle that fires the 7.62 × 51 mm NATO round. The Army's primary assault rifle however remains the indigenous 5.56 mm INSAS (Indian Small Arms System), a 'gas-operated, selective fire rifle'.

A constant anguish expressed by users since the time of induction of the INSAS into service has been, as mentioned before, its unreliability. To an extent, this was due to adopting a then-Western concept of smaller calibre lower powered rifles and the Indian stress on conserving ammunition by not having a fully automatic capability. Both in India and the West this concept has been found wanting. Indian experience in Sri Lanka and Punjab as well as J&K militancy underlined the need to have more powerful rifles permitting fully automatic fire. The void was filled by importing a large number of AK-47s and its variant rifles with plans to indigenise.

This led to the development of an indigenous assault rifle—the Excalibur. However, in June the next year, the Excalibur failed tests on quality control and ineffective firepower leading to the Army dropping its proposal to procure the assault rifle.[19]

The AK-203 Deal. It is in the backdrop of the above that the joint venture between the Ordnance Factories Board (OFB) and the Russian Rosoboronexport and Kalashnikov Groups to undertake production of the AK-203 in India by the newly created entity 'Indo-Russia Rifles Pvt Ltd (IRRPL)' should be seen and understood.[20]

There is an important lesson to learn from the Dhanush 'experience'—delays in leveraging readily available technologies, be these under Transfer of Technology (ToT) or Intellectual Property Rights (IPR), foreign or Indian, is tantamount to national loss.

The AK-203 has improved "fire accuracy and barrel lifespan" while "modern design features such as folding and adjustable buttstock, windowed and rifled magazine, and a pistol grip made this assault rifle more ergonomic". It is "lighter, shorter and deadlier than the INSAS rifle" (even without the magazine and the bayonet. Importantly, while the INSAS rifle weighs 4.15 kg the AK-203's empty weight is 3.8 kg. Also, the length of the INSAS rifle is 960 mm without the bayonet while the AK-203 has a length of 705 mm with the stock folded. The AK-203 magazine carries 30 bullets against the 20-round capacity of the INSAS rifle)"[21] all of which factors make the weapon more effective in combat.

In keeping with Defence Minister Rajnath Singh's emphasis on "100 per cent indigenisation of production of the AK-203s" the JV when fully operational is to source a significant number of components from Indian MSMEs, the potential being for "the project to act as a catalyst for UP Defence Corridor."[22]

Artillery Capability of OFB

By the end of the last century, OFB was making spare barrels and other spare parts of the 155 mm 39 calibre Bofors guns. These guns, which were used effectively in the Kargil war were supported and maintained by OFB-manufactured spare parts. Against this background, the "Dhanush" and "Sharang" truly stand out as worthy successes.

The Dhanush Gun System is in fact a success story for the public sector. Developed by the OFB and manufactured by Jabalpur-based Gun Carriage Factory (GCF), it has 81 per cent of its components indigenously sourced. With a range of 38 km, is the first long-range indigenous artillery gun with its calibre of 155 mm × 45 mm to be produced in India.[23] There is an important lesson to learn from the Dhanush 'experience'—delays in leveraging readily available

technologies, be these under Transfer of Technology (ToT) or Intellectual Property Rights (IPR), foreign or Indian, is tantamount to national loss.

A positive indigenisation story from the OFB is the development of the 'Sharang' Gun system (upgrade of the Russian 130 mm M46 to a 155 mm 45 calibre gun), the first of these had been handed over to the Army during DefExpo 2020. The completely indigenous Sharang was developed with modification of the Soltam (Israeli) Gun System at the Gun Carriage Factory. A special feature of the gun is its barrel being elevated up to 70 degrees.[24]

Impediments to Indigenisation

GSQR: The 'Fine Print' Enigma. Formulation of the GSQR has remained a contentious issue between the Services, DRDO and the OFs. There is no dispute that a GSQR should be ambitious and futuristic. The issue is with intransigence in accepting modifications and realism in accepting a 'bird in the hand is worth two in the bush' approach. If a weapon system is developed which has twice the effectiveness of the one it seeks to replace and not thrice as may be the ambition in the GSQR, then in the interest of indigenisation the weapon should be accepted.

The ATAGS 'Collaboration' Model. In this model it was the DRDO that drew up the conceptual design and private production partners were to make the product based on that design, using their engineering knowledge and skills. This surmounts the problem of high development costs which the private sector finds difficult to bear in case their product is not selected. As per Baba Kalyani the head of Bharat Forge a major Indian defence manufacturing company which, this is a model that can succeed in India.[25]

Metallurgy. "In designing the barrel of the 'Dhanush' and later the 155 × 52 calibre Mounted Gun System, OFB designers and metallurgists mastered the methodology of the BOFORS—considered a gold standard".[26] The OFB had sent these barrels to the original manufacturer of Bofors—BAE—for testing purposes and its barrels were found comparable to those manufactured abroad. This is a tribute to OFB's improved capabilities.[27] A critical aspect of metallurgy in the development of the Dhanush and ATAGS has been the use of titanium which has a direct impact on the costs of production. As India looks to go further than just indigenisation for its own use in the sphere of exports, metallurgical competencies need to be built. The need therefore is for a constant and continual interaction with academic centres of excellence in metallurgy.

'Standardisation'—A Virtue? The debate on whether we need to 'standardise and rationalise' a large number of calibres and guns—to the 155/52 mm standard calibre—to achieve higher redeployment, repair and maintenance as also minimise the range of ammunition rounds to produce/procure in adequate numbers, has been a long-standing one. The counter for equipment to be 'terrain and theatre specific' is equally forceful. While the issue in the larger context needs to be resolved within the Armed Forces, the existence of indigenous production capabilities and technologies would support developing weapons for the use of our own army as well as exports.

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A Push for 'Make in India'

The recent artillery and rifle procurement have incorporated arrangements that provide for manufacture of the systems in India. The K9 VAJRA-T 155 mm/52, (a copy of the mainstay gun of the South Korean Army) has been developed under the 'Buy Global' programme with Hanwha Techwin of South Korea as the technology partner of L&T. The first 10 K9 Vajra guns had been imported and assembled by L&T in India with the balance 90 guns to be manufactured in India.[28]

The procurement of the 155 mm, 39 Calibre Ultra-light Howitzers from the USA through the FMS route comes under the 'Buy Global' programme. BAE Systems delivered the first 25 M777 ULHs fully assembled, with the remaining 120 being assembled in India by Mahindra Defence Systems Ltd. (MDSL).[29]

Ammunition and Spares: An 'always to be remembered' lesson from the Kargil War is the desperate global search for ammunition and artillery shells, some of which were required to be procured at usurious rates. Indigenising a gun or weapon without developing indigenous capacities for adequate ammunition is faulty planning. The two must proceed simultaneously.

Facilitating the Interests of the Ground Soldier: 'User Interface' needs to be understood as incorporating the concerns and needs of the actual user—the soldier on the ground. This is readily possible if the gun or rifle is indigenously produced. Specific functional aspects such as loading trough and the loading

The DRDO, notwithstanding its very creditable achievements, is perceived both by the armed forces and the private industry as a checkpoint rather than a facilitating organisation.

tray, auto laying systems, sighting systems, ballistic calculation programmes for guns and modification to meet special requirements are immense if production is indigenised. This would reduce, if not obviate the extensive imports which are required to be done in this sphere at present.

'Barelling-up' for the Future

Lessons from Ongoing Battlefield Experiences. Recent wars, particularly the Armenia-Azerbaijan conflict, events in the Middle East, those that occurred in Afghanistan and the ongoing Ukraine war have brought to the fore several new platforms, weaponry and war-fighting capabilities and tactics. Some have raised foundational doubts on the efficacy of traditionally formidable platforms. Understanding the future character of warfare, the utility and continued relevance of platforms and equipment, now require constant evaluation, from which would derive the future equipment matrix. This is entirely in the realm of responsibility of the Armed Forces.

Budgeting Aligned to Future Needs. Both, the defence procurement and the 'political 'sensitivity' to the needs of the Armed Forces have moved very far from what prevailed just prior to the Kargil War. Notwithstanding, shortening the 'procurement loop' remains a critical aspect.

Harnessing Available Technologies. There needs to be primacy accorded to harnessing available technologies and seeking new technologies for the defence sector. The DRDO, notwithstanding its very creditable achievements, is perceived both by the armed forces and the private industry as a checkpoint rather than a facilitating organisation. This is well reflected in the undermentioned terms of reference for the recently appointed high-powered committee set up by the Government to review the functioning of the DRDO:[30]

- Restructuring and redefining the role of the Department of Defence (R &D) and DRDO, as well as their relationship with each other and with academia and industry.
- Maximise academia, MSME, and start-up participation in the development of cutting-edge technologies.

Conclusion

A larger indigenous content and a robust production capability is what would in effect provide credibility to our status of a 'global power'. Until such time we are dependent for our platforms, systems, equipment and critical spares on foreign sources, we remain to be seen as a nation without a fully capable military, especially in a protracted war. Indigenisation is the only route to break out and achieve the desired "great power" status. The former Chinese Communist Party Chairman Mao Zedong famously stated that "all political power comes from the barrel of a gun". The quintessential barrel is the barrel of an artillery gun or an assault rifle! It is only a strong and technologically advanced barrel that will provide both *'disha'* (direction) and *'doori'* (range) to attain the eventual desired objective of indigenisation—to enhance and safeguard India's National Power.

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SCHOLAR WARRIOR

SECTION IV

LOGISTICS, INFRASTRUCTURE AND DEFENCE BUDGET

CENTRE FOR LAND WARFARE STUDIES

The Employment of Drones on India's Northern Borders

GS BEDI

Abstract

India shares a combined border of 6,811 kilometres with Pakistan and China, nearly 4,000 kilometres of which is in mountainous terrain varying between 9,000 feet to almost 20,000 feet and with extremely cold climate. Maintaining vigil in difficult and inhospitable terrain at high altitudes is extremely demanding. Drones can effectively monitor the border areas, which may be hard to access through traditional means. Their employment on the Northern borders, however, does not come without challenges, both in war and peace. Drones used in India's Northern borders need to be specifically designed, equipped and operated to handle the unique conditions of the region.

Introduction

Drones—a common term used in this article to include all kinds of unmanned systems, High Altitude Long Endurance (HALE), Medium Altitude Long Endurance (MALE), Big/Small, and Armed/Unarmed—have played a significant role in many active wars like Nagorno-Karabakh (2020) and Syria since 2011. They have gathered a huge traction during the ongoing Russia-Ukraine confrontation where they seem to have played a major role in shaping the conflict, probably even more than the much-hyped hypersonic Kinzhal missile. Turkish Bayraktars

and Iranian Shaheds have become household names, but few will recall the name of the cruise missile "Neptune" that sank the Russian ship Moskva. Small commercial drones that can throw grenades with a little modification have become popular because they provide adequate 'depth of magazine'[1]—meaning their supply does not run out—and an unfavourable exchange ratio for the adversary, meaning it is far too expensive to take down a relatively cheap drone. According to the Royal United Service Institute (RUSI), a British think tank, Ukraine is losing nearly 10,000 drones per month, which equates to 300 per day, a figure unprecedented in modern military conflict.[2] There are lessons to be learned in every conflict, and if their spirit is captured, they can be applied anywhere.

Small commercial drones that can throw grenades with a little modification have become popular because they provide adequate 'depth of magazine'—meaning their supply does not run out—and an unfavourable exchange ratio for the adversary.

India became alive to drones after the Kargil operation when Israeli Herons and searchers were inducted by all three Services, for the first time, which are still operational—though their number has reduced owing to a few crashes. While these unarmed platforms offered good reconnaissance capability, both in day and night, they lacked surveillance capability owing to the limited Field of View (FOV) and range of their sensors. The frequency band used by the Synthetic Aperture Radar (SAR) could not penetrate thick foliage. Moreover, they did not have satcom connectivity thus restricting their operational range owing to the limitations of line of sight. Significant value addition was their ability to illuminate the target for laser bomb delivery by combat aircraft, thus reducing the vulnerability of manned platforms which otherwise had to undertake that task. Despite the limitations highlighted above they provided a significant boost in capability for the times when they were inducted. While the capability thus achieved remains somewhat the same as of now, India has ambitious plans to acquire cutting-edge drone technology, both through direct imports, foreign collaborations and indigenisation efforts. More than 300 start-ups are engaged in producing civilian and military-grade drones in different categories.[3] Through the systems like Reapers, TAPAS, Ghatak, Heron TP and kamikaze drones, whose capabilities are widely publicised in the public domain, India would have the ability to conduct round the clock high-resolution surveillance of vast areas of interest during peacetime, launch precision attacks at targets of opportunity

Special emphasis is being placed now on increasing warfighting capacity in high-altitude terrain by improving infrastructure,[8] stationing advanced fighter aircraft such as the MiG 29, SU-30, and Rafales all along the Northern borders[9], and introducing drones with improved technical specifications,

and assist fighter aircraft in their missions during operations. A large number of civilian application drones will be able to move operational logistics quickly to difficult terrains, without any geographical restrictions. They, will, however, remain vulnerable in contested air space and, hence would need air defence cover. Any application of drones has to be seen in the light of this capability.

Drones in Mountainous Area

The Economic Times reported on 13 August 2023 that the Indian Air Force (IAF) has deployed four Heron Mk 2 drones at a forward base in the Northern sector. The report states that they can be armed with long-range weapons, and goes on to add that the "entire country can be surveilled from the same place" quoting the Commanding Officer.[4] That may be stretching their capability too far, if taken literally, but the essence is that they are extremely capable and the IAF is happy, hoping to reap rich dividends out of their deployment in the Northern sector. Without disclosing their location, the report added, "Flying from here, the drone can cover both the adversaries in the same sortie itself". Another report published in The Telegraph on 17 August 2023, stated that the Indian Army has placed an order for nearly 2,000 drones for surveillance. The report emphasised the importance of their high-altitude capability and the associated high-altitude trials, along with highlighting the confrontation between the Chinese and Indian Army in Ladakh and Arunachal Pradesh—implying they are essentially meant for Northern borders.[5] Both these reports convey the government's enhanced focus on the Northern borders and its commitment to safeguard them with whatever it takes to do so.

India shares a combined border of 6,811 kilometres with Pakistan and China, nearly 4,000 kilometres of which are in mountainous terrain. Maintaining vigil in difficult and inhospitable terrain at high altitudes is extremely difficult. Despite best efforts, the intrusions at Kargil in 1999[6] and the Galwan incursions two decades later[7] drew widespread criticism on account of intelligence failures or gaps. Special emphasis is being placed now on increasing warfighting capacity in high-altitude terrain by improving infrastructure,[8] stationing advanced fighter aircraft such as the MiG 29, SU-30, and Rafales all along the Northern borders,[9]

and introducing drones with improved technical specifications, which would overcome the limitations imposed by the former Herons or Searchers and introduce a whole new capability in the region.

Drones, depending on their configuration, can perform a variety of roles such as Intelligence Surveillance and Reconnaissance (ISR), armed strikes, leasing, logistics, and so on. Their role when used on India's Northern borders can be best appreciated by recollecting the Kargil war in the context of drones. In brief, the intrusion was the result of inadequate Northern border surveillance, which allowed intrusions to go undetected for an extended period of time. It took more than two months to reclaim the captured territory after losing over 520 soldiers, including the pilots and airmen of the crashed aircraft, with more than 1500 wounded.[10] In terms of IAF resources, it cost two fighter planes and one helicopter crash, over 6500 air sorties,[11] thousands of conventional bombs and a number of laser-guided bombs. The army used 250,000 artillery shells.[12] Would the employment of drones have changed the complexion of this conflict or that at Galwan? Most certainly, yes. Rewind it to the winter months of 1998 when it all started and imagine that if India had the drones that it plans to induct now, how the operations would have unfolded.

A Kargil Like Operation with Modern Drones

An occasional reconnaissance sortie of the border areas by a drone would have alerted the forces of attempted intrusions well in time; focused surveillance thereafter with high-resolution imagery would have confirmed it, allowing the evil to be nipped in the bud. But, just to extend the argument, even if they arrived on the scene after all those heights were occupied, their contribution would have limited the human losses to a very large extent, if not completely eliminated them. Savings in effort would be a default by-product. Much of the IAF effort in terms of fighter aircraft sorties that went into locating the targets would have been saved. The high-resolution imagery would have provided exact locations, with coordinates, to be addressed by precision weapons. It is possible that a drone or two would have been lost to the Stinger missiles, not because they would be vulnerable to them, but for precisely the same reason for which the aircraft were lost, the 'absence of the knowledge of their presence' in the area.

Having plotted the exact locations of the targets, precision strikes could have been carried out by the armed drones themselves, or by kamikaze drones.[13] Mirage-2000 and Jaguars could have decimated the targets by LGBs, guided by

Persistent surveillance of vulnerable borders by an armed drone, which can not only detect intrusions, in day, night and all-weather, but can also address them instantly, would create a huge deterrence.

the drone's lasing system, saving much of their own reconnaissance effort, and most importantly preventing the loss of two fighter aircraft and a helicopter. A Reaper hoisted much higher, above everyone, would have provided a running commentary of the battlefield, occasionally firing its own Hellfire missile if necessary, and smaller cheap drones could have counted the number of people left in each bunker. Drones could have carried the much-needed supplies of ammunition for the soldiers on their way up and thus, in a matter of days, it would be a much easier for the Indian Army to recapture the lost ground with lesser casualties. A similar picture would emerge at Galwan. Persistent surveillance, and the ability to address targets on the ground by sufficient firepower with precision, would create enough deterrence for any misadventure by the opponent.

The Northern borders lie in an inhospitable terrain with altitudes varying between 9000 feet to almost 20,000 feet and an extremely cold climate. Drones can effectively monitor the border areas, which may be difficult to access through traditional means. Drones equipped with various sensors, such as Electro-Optical/Infra-Red (EO/IR) cameras and multi-spectral imagery, can gather intelligence about enemy movements, troop deployments, and potential threats developing in the inhospitable terrains, remote locations, and areas with challenging weather conditions, providing crucial situational awareness. The intrusions in Northern borders did not take place only in Kargil or Galwan, they are a daily affair when terrorists are pushed along the valleys or paths that are humanly impossible to monitor—especially on dark nights and inclement weather. Drones reduce the requirement of putting human personnel in high-risk or dangerous situations, keeping soldiers out of harm's way, thus contributing to overall force protection. Persistent surveillance of vulnerable borders by an armed drone, which can not only detect intrusions, in day, night and all-weather, but can also address them instantly, would create a huge deterrence.

Logistics drones can replace the traditional mules in high-altitude area and help boost operational capability as well as troop morale. Indian Army has plans to induct logistic drones in large numbers for high altitudes.[14]

However, in the euphoria of their ability, a fact that should not be lost sight of is, that the quoted conflicts took place in their own territory in an uncontested

air space. The employment of drones in mountainous terrain or on the Northern borders, does not come without challenges, both in war and peace.

Challenges of Drone Employment on Northern Borders

The Northern borders of India experience extreme weather conditions, including heavy snowfall, freezing temperatures, and strong winds. These conditions can impact drone performance, flight stability, and battery life. The drones which work well in an urban environment, may not work at all in high altitudes. The air density keeps on reducing as the altitude increases. Thinner air at altitude affects the aerodynamic performance of any flying machine, as well as the engine performance. Drones operating at high altitudes may experience reduced endurance and payload capacity, therefore, drones have to be specially selected that can sustain flight and manoeuvre in the rarer atmosphere prevalent at high altitudes.

The terrain and geographical features in the Northern borders might lead to GPS signal interference or loss, affecting the accuracy of drone navigation and positioning. A loss of GPS signal in mountainous terrain will be more difficult to handle than in plains. It is very likely that in the case of loss of signal, the drone on homecoming mode collides with high features on the way. The drones will have to be jam-resistant and incorporate a feature that not only activates homecoming mode, but also increases its altitude to above the route safety height. Maintaining reliable communication links between the drone and ground control stations can be difficult in areas with limited connectivity or lack of sufficient line of sight between the ground station and the drone owing to obstructions in between. Satcom connectivity is a must for unhindered operations of drones in mountainous areas.

To overcome these challenges, drones used in India's Northern borders need to be specifically designed, equipped, and operated to handle the unique conditions of the region. This might involve using ruggedised and cold-resistant drones, advanced navigation systems, redundant communication links, and comprehensive mission planning.

The greatest challenge to drones in wartime is their vulnerability in a contested air space. Even heavily armed drones have little onboard to defend themselves against enemy air action. The Reaper's vulnerability to air defence aircraft is a case in point. On March 14, 2023, a Russian SU-27 aircraft intercepted a MQ-9 Reaper over the Black Sea, dumping fuel on it and possibly grazing its propeller, causing it to lose flight control and crash into the sea.[15] The Reaper,

While drone operations in peacetime are more or less defined, India clearly needs to develop an operational philosophy for their employment in war, more so along its Northern borders.

armed with Hellfire missiles and laser-guided bombs, is a powerful platform but could not save itself against a fighter that did not even fire a missile. Simple intimidating manoeuvres by SU-27 made the Reaper in question lose control and crash. In comparison, drones like Heron or even Tapas or Ghatak may even be less capable and, hence will remain vulnerable in contested air space. A well-thought-of air defence will have to be planned if they have to be fielded in the contested air space for an emergent reconnaissance or munition requirement. As far as the drones' munition is concerned, it is more optimised for targeted killing of human beings of interest or some soft skin vehicles in a convoy, significantly compressing the sensor to shooter time, but they certainly cannot replace the firepower unleashed by a SU-30 or any modern fighter aircraft in that class. Their employment, therefore, has to be carefully strategised.

Way Forward for India

Selection of the right kind of drones, and not merely a large number, is important. A variety of drones are available in different categories of HALE, MALE, Fixed Wing, quadcopters, armed, unarmed, micro, mini and so on, with equally diverse sensors. It's important for the Indian defence forces to consider a combination of these drone types to create a comprehensive and adaptable drone fleet that can address various operational scenarios and challenges on the Northern border. The specific selection should be based on a thorough assessment of the region's requirements and the technological capabilities available.

While drone operations in peacetime are more or less defined, India clearly needs to develop an operational philosophy for their employment in war, more so along its Northern borders. The importance of Service integration cannot be overstated. No resource, no matter how large, is ever sufficient. It is critical to optimise coordination in order to fill critical gaps as well as avoid overkill. On this front, the experience with the induction of current Herons has not been very pleasant. The Heron of one Service does not communicate with the Ground Control Station (GCS) of the other Service, limiting not only their use in a sector, but also creating a logistical nightmare if redeployment becomes necessary for any reason.

Drones bring along enormous capability, more so where humans find it difficult to operate and conventional aircraft are too expensive and risky for the task. Drones may not be able to replace either of them completely, but they can certainly complement their efforts by providing crucial intelligence and instant firepower with precision, thus significantly compressing the vital sensor to shooter time which is difficult to achieve by any other means. Employment of drones on India's Northern borders, with the right attributes and thought-out strategy, has the potential to significantly boost India's capability and operational stance.

Air Marshal **GS Bedi,** AVSM, VM, VSM (Retd) is former Director General (Inspection & Safety) and Air Advisor at the High Commission of India, London. Views expressed are personal.

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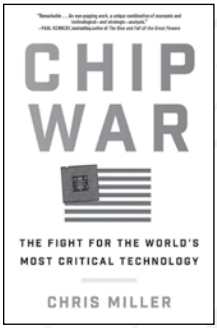

Chip War: The Fight for the World's Most Critical Technology

Chris Miller

Simon & Schuster Ltd: London, 2022,
pp. 464
₹ 1742 (Hardcover)
₹ 355 (Paperback)
₹ 263 (Kindle)
ISBN: 978-1-3985-0410-3

The book is fascinatingly introduced by the author through the narration of the *bona fide* mission of a US destroyer through the Taiwan Strait in 2020, monitoring data from aerial and satellite platforms across the Indo-Pacific. In response, the Chinese People's Liberation Army (PLA) announced live-fire exercises across the strait in a 'reunification-by-force operation', as it was called. This narration aims to highlight the growing competition within the technology sector, spilling over into the realm of geopolitics, the balance of military power, and international commerce, also how the rivalry between superpowers gains in intensity with the race for technologies becoming the area of contestation, and therefore policy frameworks being formulated by these new national interests. In the instant case, rivalry stems from the critical requirement of semiconductors, or chips as they are commonly known, the 'chip choke' that the US wields, and the Chinese endeavours to squirm out of this overwhelming control by developing its own capacities. Miller then goes on to give the reader an overview of the scale of usage of semiconductor technology in modern electronics, laying out the stupefying numbers that dominate the manufacture of chips. He deftly introduces the reliance of some of the biggest corporates and manufacturing giants such as Apple on the chips coming out of the Taiwan Semiconductor Manufacturing

Company, and adroitly joins the dots with the expertise, the financial muscle, and the government-backed research flowing out of California's Silicon Valley. Juxtaposing the narrative against the backdrop of COVID-19, Miller highlights the disruptions during the pandemic, causing a rude awakening for leaders across the globe to the fact that all computing power would be nixed if semiconductor manufacturing faced similar disruptions again. The narrow band of ownership for precision machinery holds the entire world's supply of computing and processing power to ransom.

In the first part '*Cold War Chips*', Miller uses the backdrop of World War II to discuss the development of the semiconductor industry. The US government-funded research into developing integrated circuits, helping American companies like Fairchild Semiconductor and Intel become dominant players in the industry. American entrepreneurial spirit, skilled manpower, and post-war expertise in metals and miniaturisation also contributed to its success. Miller draws interest by his lucidity interspersed with anecdotal accounts.

In '*The Circuitry of the American World*', Miller deals with the lead of the US, in semiconductor manufacturing, becoming a major factor in the Cold War, as the Soviets were forced to copy US designs and were unable to keep up. This gave the US a strategic advantage in military technology, such as the Minuteman missiles and F-16 fighter jets. The US also shifted semiconductor production to Asia, where labour was cheaper, with an eye on profitability. The aim of shifting production to Asia met two important criteria —a viable alternative to the rise of communism in the form of capitalist production, employment generation, and attendant improvement in lifestyles; simultaneously, making semiconductor manufacture more viable and profitable for US businesses.

'*Leadership Lost?*', describes how Asian chipmakers rose to challenge the dominance of American chipmakers. Japanese companies like NEC and Toshiba began to produce chips at lower cost and innovate new designs. This led to trade hostility and tariffs, but the US eventually settled with Japan to maintain its sphere of influence in the East. However, the US was still worried about Japan's growing technological prowess, which could lead to military dominance. By the 1980s, the growth of trade and foreign investments in Asian economies was also seen as a threat to American geopolitical dominance. Miller closes the third part on this important question, leaving the reader thirsting to know what transpired next.

'*America Resurgent*' is the author's elucidation of how the US regained its semiconductor leadership by pushing production to offshore locations, encouraging start-ups, and investing in research. Jack Simplot, a potato farmer,

entered the semiconductor industry and helped Micron compete with Japanese giants. Low interest rates, currency exchange rates, and the expansion of the computer industry helped American resurgence, which was cemented by the lag of Japanese companies in making personal computers or miniaturised versions for home or personal usage.

In '*Integrated Circuits, Integrated World?*', Miller describes the events in Asia, particularly in Taiwan and China. Taiwan's TSMC became a success owing to its ties with the US. China started its own manufacturing with government support, and Shanghai and Shenzhen became manufacturing hubs. The US partnered with ASML and TSMC, but was still losing ground due to offshoring. The author ends this part on another grey note — the US and its leadership was oblivious to warning signs, heading towards complacency, and invariably erosion of American dominance without the institution of strategic intervention.

In '*Offshoring Innovation?*', Chris Miller questions the American penchant for manufacturing abroad, arguing that it loses strategic control over technology, and exposes vulnerabilities of supply chains. He cites examples from AMD, Apple, and Intel to highlight damages to the US tech industry. He also argues that new technologies like AI are making offshore manufacturing even more risky; case in point of TSMC and Samsung being within breathing distance from the People's Republic of China.

The author, in '*China's Challenge*', takes us to how China is trying to wrest control of the semiconductor industry from the US using a variety of methods, including technology transfers, production on the mainland, and licensing of intellectual property rights; also investing in foreign semiconductor companies and acquiring controlling stakes in them. The US is concerned about China's growing self-reliance in semiconductors and its potential military applications. The Huawei case study shows how China is using semiconductors to challenge US tech leaders. China is also investing heavily in AI and other technologies that rely on semiconductors. Taiwan is a key battleground in US-China rivalry because it is a major semiconductor manufacturer.

The last part of Miller's book, '*Chip Choke*', discusses the US-China tech war, covering the Trump administration's trade wars, which showed the world's reliance on US chips and their relevance as geopolitical weapons. It also discusses how China's ambitions were hampered by the banning of certain exports and the hobbling of Huawei. China is pouring resources into chip development in a "Sputnik moment," but it faces challenges such as the high cost of R&D, the dominance of US chip design, and the need for subsidies.

To summarise, *Chip War* examines the geopolitical significance of microchips starting from their historical inception in an exceptionally well-researched book. The author overviews the chip industry comprehensively; using lucid language to explain technical aspects of the industry for readability and accessibility to general, non-technical audiences. Anecdotal narratives keep the reader engaged with compelling analysis of technological and geopolitical implications. The flow of the book rarely lets the reader get distracted, by expert weaving of aspects of a story spanning more than seventy years.

Chip War also provokes thought, if one were to look at it in the Indian context and infer lessons. Most of the facts and factors affecting contemporary Chinese advancements in technology due to an adversarial stance with the US, can be reasonably assumed to impact any other country with a similar growth trajectory. As such, the next conflict of interest may arise with India in the near future. It is highly unlikely that the US will let go or reduce its efforts to retain the hegemony it enjoys; to that end, any country such as India, which fits the bill for a steep growth curve, will invariably face some of the same challenges in gaining access to new and disruptive technologies. As the country tries to build up its military capabilities, it is essential to have a concurrent development in information, electronic, and cyber warfare capacities. These are directly affected by the ownership of the semiconductor industry, something which China is currently grappling with. Hence it becomes imperative for indigenisation, early, and with due alacrity.

In all, *Chip War* is recommended reading for scholars of geopolitics and statecraft, national security, military and war studies, global economics, and technology-based military applications. It delves deep into the history of the semiconductor industry, giving meaningful insights into the overlaps between facets of these subjects, and the extent to which national interests and geopolitical considerations play a role in shaping policies. Even though the book is largely centred on the US, it does provide important takeaways for others, substantiating these with real-life examples of maintaining leadership positions, building faith and capacities with favourable regulatory environments, and prudence in learning from the past. At the heart of his book lies Miller's own enduring ability to connect the dots and create a coherent picture.

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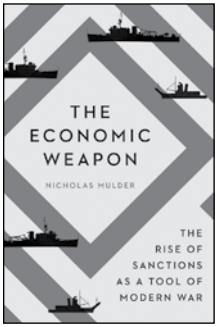

The Economic Weapon: The Rise of Sanctions as a Tool of Modern War

Nicholas Mulder
Yale University Press: New Haven CT, 2022
pp. 448
₹ 2223 (Hardcover)
₹ 1477 (Paperback)
₹ 1440 (Kindle)
ISBN: 978-0300259360

In this period where we hear and read about the US and Western sanctions on Russia, some may appear a novel method of coercion. However, sanctions have been around for long. This book by the historian Nicholas Mulders deals with the subject in interesting detail.

According to Mulder, the two distinguishing features of modern sanctions are the enforcement of norms and the establishment of the desirable international order. Sanctions in the pre-modern era meant ratification or approval. However, it undertook a different meaning in the modern era; as the world grew economically interdependent, the nature of international order took centre stage. Here, sanction acquired a second meaning, i.e., of enforcement. As the 19th-century global system was dominated by powers governed by European principles of law, sanctions came to be perceived as punitive measures to uphold the European way of civilisation against barbarism. In modern times, sanctions are understood as measures to materially exclude a targeted entity from the world economy to enforce international norms.

Mulder's work looks into the early modern history of sanctions and how they came to be an economic weapon to enforce international peace. It primarily covers the period from World War One (WWI) to the end of the Second World War (WWII). It does not merely limit itself to providing a chronology of events but also critically analyses key arguments on (i) the origin of sanctions as an economic weapon during WWII; (ii) the rationale of the founders of the League of Nations for relying on it as a means to deter wars; (iii) limitations and failures of sanctions in stopping the outbreak of WWII; (iv) the role of sanctions in unintentionally exacerbating the crisis during the Inter-War years; and (v) sanctions in the contemporary era.

By the early nineteenth century, the Europeans had realised that the World economy had become increasingly interdependent and that the London market

had become its hub. This enabled the Allied powers led by Britain and France to adopt blockades as an economic weapon against the Central powers of German, Austro-Hungarian and Ottoman Empires. The aim was to deprive them of vital resources and force their domestic populations to influence the decision-making of the elites. When the Central powers surrendered, the Allied powers attributed this primarily to the economic effects of the blockades. This confidence was carried over by the founders of the League of Nations and they included the economic weapon of sanctions in Article 16 of the League's Covenant. However, Mulder argues that this was a grave mistake by the WWI victors to overtly rely on sanctions alone as its dominant instrument to enforce peace. Blockades, initially, were able to weaken their adversaries, but later on, nations like Germany were able to overcome them by procuring the required resources from alternative means. It was more the falling troop morale in fighting the protracted war that played the ultimate role in their defeat.

In its initial years, the League was able to taste success by deterring minor powers like Yugoslavia and Greece from adopting belligerent approaches by threatening them with sanctions. However, when it came to the more considerable powers like the Fascist Italy, Nazi Germany and Imperial Japan, sanctions proved ineffective, and the League failed to stop the outbreak of WWII. Mulder considers those sanctions to be ineffective because they were not backed by coercive military power. Further, the absence of emerging powers, i.e., the United States and the Soviet Union, from the sanctions system contributed to its ineffectiveness. However, according to Mulder, one of the progressive developments was the concept of positive economic weapons. It refers to the supply of aid to nations affected by the sanctions but not its intended targets. Although the French first introduced it in the League's early phase, it found few supporters. However, during WWII, the US widely applied it in the form of the Lend-Lease Act to its allies.

Mulder also argues that sanctions inadvertently contributed to exacerbating the crisis during the Inter-War era. The memories of the blockades carried by the European nations during WWI were too immense to be ignored. Compared with air attacks and gas warfare, blockades by far contributed to the most deaths. It is estimated that almost a million lives were lost due to blockade-induced starvation. Since Germany had already experienced this before, it launched the programme to attain autarky; the other Axis powers followed this. These developments worsened the situation and hastened the European theatre towards war. The League's founders believed that economic pressures alone

could influence the state elites to alter their behaviour. However, this has not been the case; sanction memories were used to fuel ultra-nationalism, fear-mongering and violence towards minorities and perceived outsiders. The ideas of unity along cultural and ethnic lines, historic rights to lands, and belief in self-determination motivated millions to mobilise. Given the rise of such powerful forces, economic pressure alone did not stand a chance.

In the contemporary era, in the US-led world order, sanctions have proved to be a popular tool to achieve the desired outcomes without resorting to wars. However, Mulder shares a pessimistic view that it has been largely unsuccessful in achieving its objective, and despite its low success rate, it has not deterred its users. Sanction usage has doubled in the post-Cold War era compared to the Cold War era. In the Cold War era, the success rate was around 35-40 per cent; in contemporary times, it has fallen below 20 per cent. The usage of sanctions has increased, but its success rate has fallen.

In conclusion, this book can be considered an essential reading in present times, assuming the role sanctions have come to play in contemporary world politics. Mulder's critical and in-depth research on the early history of sanctions offers insightful lessons to policy-makers, practitioners and academicians alike, especially in the backdrop of the Russia-Ukraine conflict, where the debate on sanctions has dominated world politics. Diving into the early history of sanctions, one can observe that the discussions and issues that dominated in the past have continued relevancy even today.

Regarding the book's limitations, Mulder does not discuss the legality of unilateral sanctions practised by nations like the US and their effect on the international system. In the present context, the sanctions imposed by the US and its allies on the Russian Federation are not supported by all nations because they do not carry the legitimacy of a universal body like the United Nations. Such sanctions have led to the fractured international system being witnessed today.

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To,

Chief Instructor, PROMEX
c/o Centre for Land Warfare Studies (CLAWS)
RPSO Complex, Parade Road
Delhi Cantt – 110010

APPLICATION FOR INDIVIDUAL MEMBERSHIP
FOR PROMEX: PART B / PART D

Sir,

I would like to apply for Membership Promotion Exam Part B/D Correspondence Pre Course 20___, c/o the CLAWS. I understand that my membership is subject to the approval and if approved, I will respect and follow the rules and regulations of the Centre.

IC No:..... Rank and Name .....
Unit: Address for communication .....
PIN: .....
c/o:.....
Contact No: Office ..... Mobile .....Email.....

Option Exercised:	☐ Part B	☐ Part D	☐ Individual Subject
(√ the choice)	☐ Mil History	☐ Current Affairs	☐ Tactics
	☐ Adm Morale	☐ Mil Law	

Subscription Rate: Rs 2000/- for all subjects for Part B and Rs 2500/- for all subjects for Part D, less spl to corps. For individual subjects it will be Rs 500/- each for TAC/Adm / ML and Rs 600/- for MH/CA for Part B. For Part D individual subjects, it will be Rs 600/- each for TAC /Adm / ML and Rs 700/- for MH/CA.

Discount: 50% discount for subscription for Part B and D for individual officers taking CLAWS membership.

CLAWS Membership No: ……

Contact Program: Members can contact PROMEX Cell on tele for any clarification/querry during working hours any day or send the same through email (email for ML, MH and CA only). Contact program will be conducted in 3rd & 4th week of May for Part B and 3rd & 4th week of Sep for Part D at Parade Ground Campus, Delhi Cantt. Stay to be planned by members under own arrangement. Please indicate your willingness for the same here.

Willing : Yes / No

Date: (Signature of Applicant)

Online transaction (NEFT/RTGS/IMPS) ref No …… dt …….. **OR** Demand Draft/multi-city cheque No……dt……. for Rs…… **in favour of PECPCC** payable at **Delhi Cantt** is enclosed herewith.

Bank Details for online transaction: Name of Acct Holder: **PECPCC**, Name of Bank: **HDFC**, A/c No : **50100077341432** , IFSC : **HDFC0000139**, MICR : **110240020**

Eligibility: Serving Army officers.

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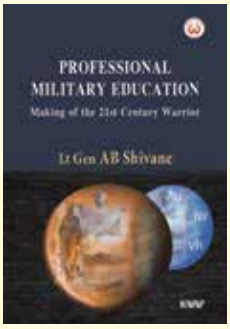

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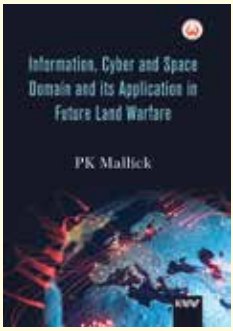

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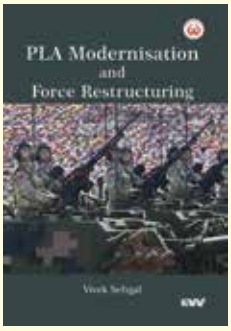

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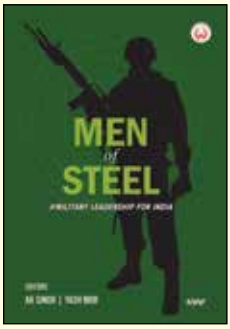

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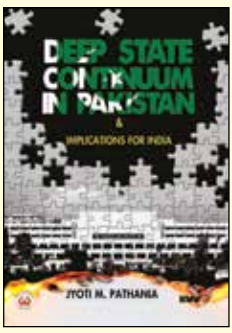

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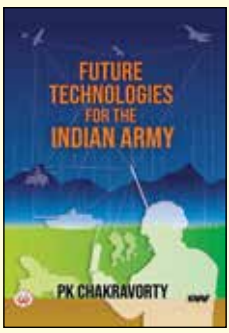

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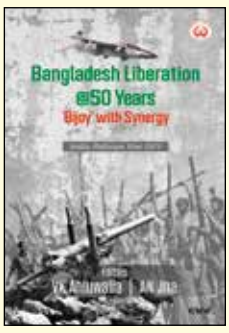

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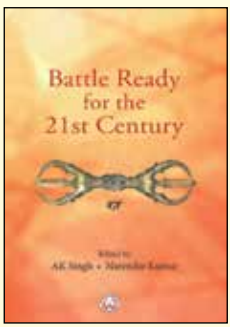

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