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India Must Look Beyond Main Battle Tanks

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This discussion document analyses the relevance and future utility of Main Battle Tanks from India's standpoint as battlefields become more transparent. It views that MBTs will soon become obsolete. Thus, India must look beyond MBTs and invest in emerging asymmetric capabilities.

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Executive Summary

The paper argues that Main Battle Tanks (MBTs) are rapidly losing operational and strategic relevance for the Indian Army amid evolving warfare paradigms and the emerging "transparent battlefield." It finds that India's traditional doctrine, which assigns MBTs a decisive offensive role, is misaligned with current realities—specifically, as nuclear deterrence limits the scope for conventional manoeuvre warfare, thereby eroding the rationale for heavy armour-led assaults. Terrain factors across India's borders – mountainous north, marshy plains, and deserts – further constrain MBT utility, exposing their vulnerabilities to anti-tank, drone, and precision-guided threats.

The analysis highlights that sustaining MBTs demands disproportionate financial and logistical resources. India's ongoing FRCV acquisition plan underestimates true procurement and lifecycle costs, already inflated by survivability upgrades that fail to enhance battlefield effectiveness. Meanwhile, adversaries' increasing use of network-centric ISR, loitering munitions, and anti-armour systems dramatically undermines tank survivability.

In contrast, the paper identifies lighter, agile, and networked alternatives – such as light tanks, IFVs, drones, and loitering munitions – as more viable for India's strategic and geographic realities. Overall, MBTs are deemed legacy systems whose functions can now be better achieved through distributed and technology-driven capabilities aligned with modern, asymmetric warfare.

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1. Introduction

The Main Battle Tank (MBT) emerged from the Second World War experiences and has traditionally combined three fundamental characteristics: firepower, protection, and mobility. Its large-calibre gun can deliver decisive direct fire, its heavy armour withstands most small-calibre and artillery hits, and its tracks allow cross-country movement. Together, these give the MBT *shock action*: the ability to engage and destroy fortified positions and enemy armour, while staying mobile under fire.[1]

Modern MBTs typically mount high-velocity guns ranging from 120 mm to 125 mm calibre,[2] capable of defeating enemy armour at ranges exceeding 4,000 metres, while engaging multiple target types through varied ammunition selection.[3] Contemporary fire control systems enable accurate engagement while moving, with thermal imaging and laser range finding providing all-weather capability.[4]

Recent British and American military analyses note that despite advanced threats, a heavy armoured force remains the best option for high-intensity warfighting due to its combat power.[5] Tanks still impose friction on enemies, forcing them to spread mines, allocate air assets or stockpile precision weapons to counter them.

> Without robust air defence, electronic warfare, dispersion and deception tactics, armoured forces now face unsustainable attrition from cheap, unmanned platforms. The war in Ukraine and Nagorno Karabakh reveal that small, armed drones are responsible for a disproportionate number of tank casualties. In Ukraine, NATO assessed that more than two-thirds of tanks destroyed in recent months were hit by FPV drones; a pattern showcasing the shifting economics of armoured warfare. In Nagorno-Karabakh, OSINT sources indicate Armenia lost over 40% of its legacy Soviet-era armour, with Turkish TB2s and Israeli loitering munitions central to Azerbaijan's campaign.

That said, as countermeasures against armour have become more accurate and lethal, the modern MBT faces unprecedented challenges in modern warfare, as recent conflicts such as the war in Ukraine, have shown. Recognising this, contemporary

studies stress that future tanks must shift away from protection and towards mobility, using deception, drones and network support to survive.[6]

In practice, MBTs operate primarily within a combined-arms context to be able to discharge their battlefield roles effectively and for their survival. They rely on infantry, artillery, aviation and engineers for close support, and on logistics to keep them fuelled and armed. By themselves they lack the same level of battlefield awareness (including beyond line-of-sight) that reconnaissance drones, artillery radars and satellites provide.[7] As part of an armoured force structure, MBTs, plus supporting vehicles such as Infantry Fighting Vehicles (IFVs), are valued for enabling mobile warfare under fire.

Historically, therefore, tanks have endowed an assaulting force with a mobility and protection advantage in open terrain and urban warfare. However, recent conflicts have demonstrated fundamental shifts in the dynamics of armoured warfare in modern battlefields. Ukraine's armed forces have achieved tank destruction rates exceeding 65% through drone operations, while Armenia lost over 40% of its equipment inventory to Azerbaijani unmanned systems during the 2020 conflict.[8]

Integrated Battle Groups (IBGs) reorganise divisions into smaller, task-organised teams-infantry, armour, artillery, engineers, air defense and logistics – under one commander to mobilise faster and fight along short frontages. The concept compress sensor-to-shooter timelines and enables theatre-specific packages (plains, desert, mountains).

India fields one of the largest MBT fleets worldwide, yet cheap drones, networked sensors, and precision anti-tank weapons now threaten heavy armour on every front. This compels a re-assessment of the MBT's utility for the Indian Army, particularly given India's unique two-front strategic challenge against Pakistan and China. The Indian Army's published doctrine still envisions armoured divisions as the decisive hammer in a high-intensity war. The Cold Start doctrine (an unofficial post-2004 optimisation of the orthodox offensive doctrine)[9] and the newer Integrated Battle Group (IBG) concept (in the 2018 Land Warfare Doctrine) both assume that MBTs will spearhead advances. Indeed, Army leadership asserts that IBGs—intended to be

lean, agile and tailor-made combined-arms brigades—will still include powerful armoured elements and organic anti-tank and air-defence weapons.[10] This, perhaps, reflects an acceptance that the MBT's centrality in India's force planning is ceding ground to the other elements of combined warfare that have advanced rapidly since the turn of the century.

> In June 2025, the Army ordered ~450 Nagastra -1R loitering munitions – in addition to the 2024 order – creating organic, one-way attack capacity at unit level. In parallel, the Army's HIM-DRONE-A-THON series operationalises FPV/loitering for high-altitude use. Official demonstrations and media reports show FPV strikes drones passed qualification tests and were validated for anti-armour payloads in 2025.

Besides, several factors and emerging trends prompt a fresh look at MBTs and a reassessment of their effectiveness. First among them is the emergence of 'transparent battlefields' – defined as the near-real-time awareness of all domains (air, land, and sea), enabled by smart ISR (intelligence, surveillance, reconnaissance) and the proliferation of sensors, drones, satellites and networks that increasingly strip away concealment.[11] Such ubiquitous ISR drastically enhances lethality by ending the safety of rear areas and stealth.[12] If the enemy can see one's every move, using networks of sensors and satellite imagery, massing tanks for an assault becomes a perilous exercise unless countered by camouflage and jamming. Drones and a wide-area radar can track armour long before it arrives, while precision-guided artillery and missiles can target a tank formation from afar.

The second factor here is the proliferation of precision anti-tank weapons. Modern ATGMs (for example, Pakistan's Baktar-Shikan and China's HJ-12) feature advanced guidance and top-attack warheads. Loitering munitions (kamikaze drones) can home in on tanks' weakest roof armour.[13] In Ukraine and elsewhere, even well-protected tanks have been ambushed by the combined threats of man-portable ATGMs, air power, mechanised anti-tank platforms, and artillery. Tanks are adapting via Active Protection Systems (APS) and Explosive Reactive Armour (ERA), or adding cages of slat armour but these counter-measures have their limits

in terms of range, cost, weight and often focus on limited threats at a time.[14] A networked combination of loitering drones, guided missiles and artillery have put heavy MBTs at risk, especially in open terrain.

India's Networked Warfare Capabilities: The IAF's IACCS already fuses radar/sensors feeds for real-time air-defense control and was highlighted during Operation Sindoor in 2025. The Army launched SANJAY – Battlefield Surveillance System in Jan 2025 to integrate ground and aerial sensors into a common picture over secure Army networks. The Defense Communications Network (DCN) underpins tri-service connectivity. Bottom line: Air-Defense networking is proven; Army ISR/C2 networking is scaling, with full joint data-sharing at tempo still a work-in-progress.

Finally, doctrinal, environmental, and strategic shifts reduce the contexts where tanks are useful. India's two-front challenge, in light of deepening collusion between Pakistan and China, features contrasting terrains – with flat deserts in the west versus high mountains in the north. Heavy MBTs excel in the Punjab plains and desert of Rajasthan, but have limited utility in the Himalayas (with its thin air choking engines, and poor roads limiting mobility).[15] India's other combat engagements—such as anti-insurgent and peacekeeping operations—rarely need main guns, making heavy armour an investment without a definite role. Technological shifts, such as the rise of network-centric warfare, now emphasise rapid information processing and agility over sheer mass.

Active Protection System detect and defeat incoming threats with soft-kill jamming or decoys and hard-kill interceptors. In Feb 2025, the Army issued an RFI for APS on T-90S/SK, specifying hard-kill, soft-kill and counter-USAS functions – clear intent to field. Parallel DRDO work continues on an indigenous APS. Public evidence points to trials and procurement actions underway; wide, fleet-level fitment will follow test results, budgets and integration. This mirrors global best practice (e.g. Israel's Trophy and aligns with India's push to harden armour against drones and ATGMs.

Thus, it is fair to say that the battlefield has evolved much faster than the MBT. Now the question arises: what is the future utility of the MBT for the Indian Army? The

MBT's value cannot be gauged by its firepower and traditional doctrinal role alone. At the same time, focusing solely on how much protection a platform like the MBT provides can result in overlooking the stress that an increase in fuel consumption can impose on logistics. Without answering the question of whether MBTs are still relevant or not, and to avoid simplistic judgements of obsolescence and relevance, we formulate a multi-dimensional framework to guide our analysis.

2. Methodology and Framework

Assessing a major weapon system like an MBT, demands multiple criteria. A purely "utility or not" conclusion ignores key trade-offs. For example, one could argue that MBTs are vulnerable to ATGMs, so they're obsolete or conversely proclaim MBTs deliver unmatched shock, so they're irreplaceable. Both statements have truth, but neither is sufficient alone. Historically, armies have learned to adapt MBTs (more armour, APS, networked C2) rather than abandon them outright. Likewise, alternatives—light armour, drones, artillery—have drawbacks in certain roles, especially relating to holding contested territory. A multi-dimensional framework, illustrated here, ensures that all critical facets of a weapon system, like an MBT and proposed alternatives, are assessed.

2.1 Role, Doctrine, and Strategic Context

What is the MBT 'supposed' to do? While MBTs retain doctrinal roles in both manoeuvre and attrition warfare, a passing glance at recent conflicts—including Ukraine, Syria, and Gaza—reveals their employment has predominantly shifted towards attritional roles.[16] Modern battlefield conditions, particularly enhanced ISR capabilities and proliferation of precision anti-armour systems, have constrained opportunities for traditional manoeuvre operations. This often forces tank operations to degrade into attritional patterns, regardless of initial tactical intent.[17] We must examine the role of MBTs and other weapon platforms in India's stated doctrine. Do those doctrines make sense, given the new threats to armour?

We situate the MBT within India's broader security and warfighting strategy. What roles best serve India's objectives (deterrence, territorial defence, power projection)? How do Pakistan and China value armour in their doctrines, and what are their MBT and anti-tank capabilities deployed on each of India's fronts where MBTs may be fielded? Do MBTs matter for expeditionary or sub-conventional scenarios?

2.2 Terrain

An MBT's performance differs according to the terrain it is deployed in: flat deserts (favourable) vs mountains or jungles (unfavourable). We analyse each relevant Indian land war theatre (Western plains, Rajasthan, Himalayan passes) to see where MBTs and other platforms excel or struggle. This dimension captures factors such as ground pressure, engine performance in thin air, logistical reach etc.

2.3 Threats

New sensors and munitions are game-changers. Assessing MBTs requires identifying threats (drones, top-attack ATGMs, loitering munitions, surveillance networks) and determining whether the MBT can counter them (with APS, jamming, decoys). Ultimately, this estimates the odds of survivability under current and future adversary capabilities.

2.4 Economics

Weapon system choices hinge on cost and capacity. Here we examine acquisition and life-cycle costs (fuel, maintenance) of MBTs versus alternatives. India's industrial base (production lines, supply chain, R&D) and manpower constraints shape what it can absorb. Also important is the industrial lock-in: once a huge MBT programme is underway, political and economic pressures can keep it going even if its battlefield utility wanes. We consider past cases, such as the stalled Arjun Project, as lessons in this dimension.

2.5 Alternatives

In combined-arms operations and network-centric warfare, no weapon system exists in isolation. We compare MBTs with other platforms that can fulfil (at least some parts of) its roles. This includes Light Tanks (like India's planned Zorawar light tank), Infantry Fighting Vehicles (IFVs) with large guns or turrets, Mobile Gun Systems/Artillery, and unmanned systems (ground robots and UAVs). Each of these has its own strengths. We evaluate if a brigade of lighter, networked vehicles or a swarm of drones could replace heavy armour in certain missions. The following table encapsulates the various parameters of the framework.

Table 1: Multidimensional Framework to Assess the Utility of MBTs

Variable	Core Questions	Indicators
Role and Doctrine	How does the current doctrine envisage armour employment?	Armoured force structure and organisation, combined arms & integration, doctrinal shifts.
Strategic Context	Do the platforms advance national security aims versus specific adversaries?	Established escalation matrix, parity with adversaries' doctrine, capabilities and numbers.
Terrain	Does geography help or hinder platform deployment and efficiency?	Altitude, soil bearing capacity, land type and texture.
Threats	What kinetic and non-kinetic threats challenge armour?	ATGM range and penetration, drone lethality.
Economics	Opportunity cost: Can the industry afford, produce, and sustain the platform fleet?	Unit cost, lifecycle cost, domestic content.
Alternatives	If platforms can achieve similar objectives in isolation or in conjunction?	Light tanks, IFVs, UGVs, missiles, and rocket artillery.

The framework allows us to cite specific evidence for each claim. For instance, rather than vaguely dismissing MBTs as "vulnerable to ATGMs", we showcase how an Active Protective Systems (APS), or an Explosive Reactive Armour (ERA) may improve survival materially. Alternatives such as light tanks may lose the ability to provide much protection or carry large guns, but they can cover and hold ground more rapidly. This allows them to discharge the traditional role of the MBT, in conjunction with artillery or drones, in terrains where MBTs may be otherwise relegated to long-range fire support only. We also avoid the error of judging tanks solely on cost or performance.

3. Role, Doctrine, and Strategic Context

Historically, tanks were conceived for high-intensity offensive '*manoeuvres'* – smashing through enemy lines and exploiting breakthroughs. The classic model holds that infantry, artillery and armour work together: infantry secures and cleans up, artillery provides suppression, and tanks offer rapid penetration and defence.[18]

India's official military strategy doctrine, too, has long been armour-centric in conventional scenarios. A perusal of India's military and war history, along with the study of publicly available official documents, offers some insights.

India's Land Warfare Doctrine—released in 2018—envisages that in a conventional war scenario on the western borders, the strategy would entail swift force application "with the aim of destroying the centre of gravity of the adversary and securing spatial gains."[19] In so far as a conventional war scenario on the northern borders is concerned, the objectives are differently worded. The doctrine states, "all measures will be undertaken to enhance deterrence…operations…will be force centric, through effective multi-tiered deployment, rapid mobilisation."[20]

Within the existing doctrine, the MBTs, which form the core of the armoured corps, which in turn form the core of Integrated Battle Groups (IBGs), occupy an important

position. The MBTs are expected to undertake both offensive and defensive roles. In their offensive capacity, they are tasked with breaking through the enemy defences and making swift inroads into the enemy's territory, with the eventual aim of imposing punitive incursions. Thus, if one further breaks down these objectives, the MBTs are traditionally designed to serve three objectives in their offensive role: mobility, firepower (while providing cover to infantry) and territory capture. In their defensive role, on the other hand, they are expected to hold the enemy advances.

However, the changing characteristics of the battlefield and evolving warfare raise the following questions. Are conventional wars plausible between India and its two adversaries - China and Pakistan? How realistic is the expectation of imposing punitive incursions against China and Pakistan? What is the end goal of such an endeavour? Are MBTs the best-suited tool to achieve that goal? Or are there any credible alternatives—both inside the conventional battlefield and outside—that can replace MBTs? Are there more effective ways to acquire the same leverage?

A discussion on each of these questions is necessary to adjudge the utility of MBTs in the current context. India faces a peculiar challenge, as both its adversaries are nuclear-weapon states. This reality has increased the risks of large-scale conventional war.

China and India have shown an aversion towards engaging in even short conflicts, let alone conventional large-scale wars. While the LAC has remained volatile over the decades since the 1962 war—the last time the two countries skirmished—the respective leadership has moved swiftly to contain any crisis, despite frequent military standoffs.[21]

And there are reasons why neither side has shown any willingness for such endeavours. First, the power differential between the two sides isn't adequate for either party to achieve significant territorial gains against the other. Second, both sides are of the opinion that the strategic cost of such an endeavour would far outweigh the territorial gains. This is, if either of them manages to convert the stalemate—the most plausible outcome—into a victory.

From India's perspective, not only is China a nuclear state, but it also enjoys a conventional superiority. Thus, imposing punitive incursion on China would be near impossible with the existing power differential. The fact that India's land warfare doctrine doesn't mention "spatial gain", as clearly as it does with respect to its western adversary, is reflective of this limitation.

However, proponents can argue that MBTs can be used to defend territory along the northern frontier. The question still remains whether MBTs are the most efficient and cost-effective platforms for such a role. Of the three core functions of MBTs—mobility, protection, and firepower—mobility is least relevant to static defence.

MBTs can still provide cover, but their use in this role faces two limitations. First, deploying such costly platforms as protective shields is economically unsound. Their value lies in offence, not defence. Second, MBTs cannot extend effective cover over large areas or formations, which restricts their utility. Defensive positions are better strengthened by leveraging terrain and natural obstacles, supported by artillery.

In their defensive role, firepower is the only meaningful contribution MBTs can make. Yet even here, their role overlaps with existing systems. Defensive firepower already comes from a mix of small arms, machine guns of varying calibres (light, medium and heavy), rocket launchers, mortars, and towed artillery. This combination delivers a layered and flexible response, consequentially reducing the marginal utility of MBTs.

Contrary to its northern adversary, India does enjoy a favourable power differential vis-à-vis Pakistan. Yet, the possibility of imposing territorial costs is limited herein as well, owing to the nuclear umbrella. The two countries did fight a short war in 1999 in Kargil, soon after they went nuclear, but it was an anomaly. The two countries had conducted their nuclear tests roughly a year before the Kargil War broke out. That one year was too short a period to have established credible nuclear deterrence, notwithstanding the dangers involved.

Over the last two decades, both countries have expanded their nuclear arsenals and warheads. This has led to the establishment of credible nuclear deterrence and limited the scope for conventional wars. Aware of the fact that it cannot win a conventional war against India, Pakistan has attempted to expand the scope for unconventional warfare through state-sponsored terrorism under the nuclear umbrella. Since the turn of the century, India has refrained from responding to threats emanating from Pakistan by launching a large-scale offensive, for two reasons: anticipating a nuclear response and avoiding the commitment trap. Instead of being dragged into the conflict with its western neighbour, India chose to prioritise economic development.

But even as India has attempted to call Pakistan's nuclear bluff and expand the space for conventional military response, via surgical strikes (2016) and air strikes (2019, 2025), the space for large-scale conventional warfare—centred around punitive incursions—may be limited.

Furthermore, even with respect to responses to Pakistan's state-sponsored terrorism, the objective on the ground, notwithstanding the one laid out in the doctrine, isn't imposing punitive incursion – as is evident from the previous cases in the past decade.

To sum up, the inadequacy of an overwhelming power differential in the conventional sense and the existence of a nuclear umbrella severely limit India's capability to impose punitive incursion.

While China enjoys a positive power differential vis-à-vis India, the latter's capabilities are adequate enough to enforce a stalemate. The same logic applies vis-à-vis Pakistan. While India enjoys conventional superiority over Pakistan, it is not significant enough to avoid a stalemate. While it is true that parts of India's boundary remain unsettled with China and Pakistan, neither India nor its adversaries have the wherewithal to alter geography and redraw the boundaries by force.

Therefore, if the role of MBTs within the Indian Military Doctrine is to break through the enemy defences and capture territory, the discussion above indicates that such possibilities are severely restricted.

As mentioned above, firepower, while providing cover and mobility during advance, are the other two roles entrusted with MBTs in their offensive capacity. Let us consider firepower first. The MBTs, installed with large calibre guns, are capable of hitting targets up to a range of 4,000 metres. While the artillery can also provide firepower—far greater than MBTs—traditionally, they are faced with two drawbacks. First, there exists a delay in requested firepower owing to the time taken in relaying approximate coordinates from the forward position to the artillery unit, which is stationed well behind the first line of defence. The artillery support then launches projectiles after making requisite calculations. And second, the artillery fires, more often than not, in a general direction. Thus, accuracy is limited. But on the battlefield, the MBTs can respond with greater urgency to provide swift firepower along with greater accuracy.

The question arises: are there platforms that can, unilaterally or in unison, replace these tasks for MBTs? To begin with, artillery has become more accurate and precise over the past decades. The limitation with respect to gathering and relaying the requisite coordinates can also be overcome via real-time battlefield information. The cost and effort of achieving greater precision, and reducing delays in artillery fire, is far less than trying to make MBTs immune and insusceptible.

Furthermore, the Light Tanks, Infantry Fighting Vehicles (IFVs), Loitering Munitions, Unmanned Aerial Vehicles (UAVs) emerge as plausible alternatives (discussed later). These can provide comparable firepower with greater urgency and precision.

Mobility is another reason that is put forth to justify the continued relevance of MBTs. But as shown in the subsequent sections, the mobility of MBTs stands severely limited owing to the emerging threats, combined with terrain-related challenges. As battlefields become more transparent, resulting in easy discovery, how sensible is it to continue to field extremely expensive MBTs on the battlefield?

Nevertheless, even if we concede that full-scale conventional wars are plausible, and the MBTs can impose punitive incursions against the adversaries, the question arises:

what does the Indian political leadership intend to achieve from territorial capture? Two possibilities emerge - either hold the territory in perpetuity, or use it as leverage in post-war negotiations.

The only territories that India can legally and legitimately justify holding, and acceding to its Union, are Pakistan Occupied Kashmir (PoK) and Aksai Chin. However, MBTs may not offer India a tactical advantage over its adversaries in these terrains, as we show later.

And if the aim is to use the 'captured territory' as a bargaining chip during post-war negotiations—including to get back PoK or Aksai Chin—two questions arise. First, if it is possible to capture territory as large as PoK or Aksai Chin in other sectors through armoured incursion? And second, are there better and more cost-effective ways to gain leverage on the battlefield than imposing punitive incursions? We are of the opinion that even in the most optimistic scenarios, where territorial capture are plausible, the marginal utility of MBTs is severely limited.

4. Terrain

Terrain and geographical features are perhaps the most predominant determinants in formulating battle strategies in land warfare. More so for India, as it shares very unusual boundary features with its neighbours, which are uncommon to most of the armies around the world. India's frontiers with its adversaries can be broadly classified into marshy and swampy, sandy, plains, and mountainous. Consequently, these features do have a bearing on the effectiveness of MBTs.

When MBTs were first introduced on the battlefield during the Second World War, they were designed to overcome trench warfare, which was the mainstay of defensive positions in the plains. The trench warfare tactics involved digging deep parallel trenches, laying barbed wires and deploying machine guns to slow down enemy movement, while maximising their casualties. The conveyor belts fitted in MBTs gave them improved mobility on rugged terrain, enabling them to act as floating land boats. Additionally, tanks could easily repel attacks from small firearms and infantry

weapons to reduce casualties that threatened to halt the advances of the charging army.

Furthermore, the MBTs also provided the advantage of mobile, heavy firepower. Once the advance pushed deep into enemy territory, MBTs could destroy built-up defences and fortifications with greater precision – targets that lay beyond the range of that era's artillery. Artillery fire was only accurate enough to fire in general areas, as against specific targets. Thus, the ability of MBTs to overrun the enemy's trench defences, swiftly navigate rugged terrain, and repel attacks from small arms made them an indispensable asset for ground invasion. The requirements of the battlefield, however, have evolved since then, but the MBTs have continued to remain the mainstay of ground forces.

From India's perspective, the effectiveness of MBTs needs to be evaluated against the constraints of terrain and war objectives. Given that almost the entire stretch of LAC and most of LoC is of mountainous features and even forested in some instances, tanks may not be the ideal equipment, as ground invasion in its traditional sense (occupation of swathes of plains) that the tanks are designed to perform does not apply to mountain warfare. Thus, the presence of meandering features and the lack of open fields severely limit the mandates of tanks. Furthermore, the entire stretch of LAC and most of LoC is a high-altitude battlefield – the highest in the world. Given their heavy structure, their operation and mobility on high altitude and often narrow road strips, become risky.

One of the biggest drawbacks that the tanks suffer from is their limited situational awareness on the battlefield. This makes them excessively reliant on ground support from infantry, medium battery artillery and other small armoured vehicles advancing with it. Despite advances in technology, tanks have been unable to shrug off their visual disability completely. This makes them increasingly susceptible to attacks from the flanks. The mountainous landscape allows for the effective deployment of guerrilla tactics that can significantly expose the vulnerability of MBTs. A group of well-camouflaged, man-portable anti-tank weapons can take out several MBTs from a safe distance without revealing their location. Thus, Combined Arms Support has

become a mainstay of tank warfare. Yet, it is relatively easy to destroy tanks owing to their inability to take effective cover because of their huge dimensions. Examples from Israel-Gaza and Russia-Ukraine have shown us the effectiveness of mobile rocket launchers in guerrilla warfare. Additionally, the extreme climate at high altitudes brings other sets of challenges for tanks, such as extensive fuel consumption and engine failure/malfunction.

The swampy and marshy terrain that covers vast swathes of the India-Pakistan border can also prove tricky for tanks and hamper their operation. The battle of Asal Uttar, the largest armoured tank battle fought since the battle of Kursk in WWII, offers some lessons. The battle—fought between India and Pakistan in the war of 1965—witnessed Pakistan's 1st Armoured Division, consisting of Patton, Sherman and Chaffee tanks supported by its 11th Infantry Division, cross the Indian border and take control of the Indian town of Khem Karan. At this point, the Indian Army made a tactical retreat and assumed a horseshoe formation with Asal Uttar as its focal point. The Indian troops, while falling back, flooded the sugarcane field and drew the Pakistani forces inside the horseshoe defensive formation. The swampy field slowed down the Pakistani tanks, before turning them effectively immobile. Once the Pakistani Armoured Division was in firing range, Indian troops, along with 9 Deccan Horses (an armoured regiment consisting of Sherman tanks) engaged in a fierce battle, destroying 99 Pakistani tanks while losing 11 of their own.

The battle of Asal Uttar exposes the challenges that MBTs may face in swampy and marshy terrain. Not only can the terrain can be used by the Indian Army to blunt Pakistani advances, the adversary could use the same tactics to blunt Indian armoured advances in the region.

Meanwhile, the sandy terrain presents its own set of unique challenges. As the equipment becomes more sophisticated, the maintenance becomes even more taxing. One of the primary challenges of operating MBTs in the desert is coping with the extreme heat that builds up within it. The temperatures during the daytime can rise to more than 50°C. The inside of the tank can further heat up to an additional ten degrees. Regulating heat and cooling the system from within escalates the cost and

weight of the equipment - defeating the purpose of building lighter tanks. Extreme heat also significantly increases the chances of engine failure, power loss, and malfunction of other electronics and mechanical components. The Indian Army has expressed dissatisfaction on several occasions in the past when indigenously built MBTs, especially Arjun tanks, failed to meet expectations in their desert trials.[22]

Sand dust is another challenge that tanks routinely encounter in such terrain. Often, sand accumulates in critical components such as engines, wheels, and barrels, thus rendering them non-functional. The case study of Britain's Challenger II MBTs during their participation in the Saif Sareea 2 exercise in Oman (2001) offers important insights.[23] Britain's 66 tanks, each costing 2.5 million pounds at the time, frequently broke down during the exercise as their filters kept clogging up. While filters were designed and expected to last for 24 hours, they could not withstand over four hours in those conditions.

Thus, serviceability and maintenance are huge challenges for MBTs in such terrain. Any failure in this regard on a battlefield becomes a major source of vulnerability, especially when encountering incoming fire. The Indian Army has faced these challenges on several occasions during trials and exercises.[24]

Anyway, MBTs cannot take effective cover in an open terrain because of their giant size, thereby hindering swift replacement and repair of critical components. To add to their misery, MBTs are susceptible to bogging down in soft sand – characteristic of the Thar Desert.

The Battle of Longewala in this context is worth mentioning, when a unit of 120 Indian soldiers was forced to defend a post against an army of 4,000 Pakistani soldiers accompanied by 40 tanks and a medium artillery battery during the 1971 war. Against an overwhelmingly superior army, the Indian troops were operating with only three MMGs, three 81 mm Mortars and one Jonga-mounted RCL. The task entailed halting the Pakistani advances that began at midnight, until the reinforcement could arrive the next day. The IAF too was helpless before the first light.

The successful defence of the post by the Indian Army demonstrated the drag a sandy terrain can prove to be for MBTs. It also demonstrated the effective use of terrain by the Indian Army to form defensive positions, as they occupied high grounds atop sand mounds. The soft sand bogged down Pakistani tanks, rendering them immobile while many of them suffered engine failure. The lack of cover in an open terrain also worked against Pakistani tanks.

The Pakistani tanks became sitting ducks in the sandy terrain. Soon after the first light, India's Hunter and Marut bombers wreaked havoc on the Pakistani Army. Together, India's ground anti-tank fire and bombers destroyed 36 Pakistani tanks, 100 of their other armoured vehicles and 200 of their soldiers. While the Pakistani forces did make a series of very questionable and faulty decisions, the fact that the terrain worked against their strength – the MBTs - needs to be underlined here.

5. Threat Environment

We also need to capture the spectrum of threats that a platform faces on the battlefield, as well as the countermeasures available to it. For tanks, the threat environment today includes advanced Anti-Tank Guided Missiles (ATGMs) (infantry-portable or vehicle-launched) which often use top-attack, or tandem-warhead systems to defeat armour; loitering munitions and armed drones that can hunt vehicles from the air; increasingly ubiquitous sensor networks (UAVs, satellites, ground radars) creating a "transparent battlefield", where hiding a 50–70 tonne tank is ever harder; and traditional threats like anti-tank mines, artillery fire, and enemy tanks. The key question now is whether the offence-defence balance in India's fronts has shifted enough as to seriously jeopardise the MBT's value.

Abrams, Merkava, Leopard 2A8 vs Arjun

Arjun Mk-1A (120 mm rifled gun, advanced FCS) is tailored to Indian terrain and logistics. Western peers field 120 mm smoothbores with digital vetronics and, crucially, operational APS. Merkava Mk 4M integrates Trophy; Leopard 2A8 is the current production standard (often with Trophy integration) and L55A1 gun; Abrams SEPv3/4 adds power management, sensors and ammunition interfaces, with Trophy fitted to selected fleets. There is no fielded 'Leopard 3.' Capability gaps today hinge more on APS and digital architecture than calibre.

Indian MBTs (primarily T-90S and upgraded T-72M1, plus some Arjun Mk1A) face a lethal array of threats from both Pakistan and China's arsenals. Pakistan has equipped its infantry with the Baktar-Shikan ATGM, a licence-produced version of the HJ-8/9 series from China.[25] Pakistan's defence industry also produces tandem-warhead RPG-7 rounds, and recoilless rifle munitions capable of damaging tanks at close range. Meanwhile, China could employ its HJ-12 ATGM (fire-and-forget, 4 km range, similar to Javelin)[26] in any border skirmish, or provide them to Pakistan; China's army and allied militia units are saturated with ATGMs like HJ-8, HJ-10 (heavy ATGM mounted on vehicles), and even portable HJ-11/Red Arrow-12 guided rockets.[27] Thus, in any conflict, Indian tanks can expect to be targeted by dozens of anti-tank missiles from multiple angles. Many of these missiles use top-attack profiles, or tandem warheads, specifically to defeat tanks' strongest protection.

Both adversaries also field potent loitering munitions and armed drones. The PAF has relied primarily on Chinese and Turkish-origin platforms such as the Wing Loong I and II, along with the Bayraktar TB2, to provide robust ISR and strike capabilities as well as the ability to participate in direct combat operations. Pakistan also fields domestically produced UCAVs—such as the Burraq and the Shahpar—in similar roles.[28] Pakistan's close relationship with both China and Turkey will likely continue to provide Islamabad with access to improvements in drone platforms and warheads. During Operation Sindoor, India's precision strikes reportedly damaged the Murid Airbase in Chakwal, Punjab, which hosted Pakistan's drone operations.[29] As such, any Indian offensive that sees the deployment of MBTs on the western front, will invariably see similar precision strikes on Pakistan's drone hubs as a prelude to a tank conflict; it is unclear how effective this may be.

China fields an extensive drone force: from small quadcopters (for artillery spotting) to large Medium Altitude Long Endurance (MALE) drones (Wing Loong, CH-4), which could carry anti-tank missiles or guided bombs. China also likely has its own loitering munition models, given that the CH-901 and WS series of loitering drones have already been displayed. In a conflict in Ladakh or Arunachal, India should envisage Chinese reconnaissance drones feeding targets to long-range rockets, or

sending swarms of loitering munitions to dive onto Indian armoured columns climbing up mountain roads.[30] Chinese strategists consider loitering munitions "highly cost-effective" tank killers in an attrition war;[31] a view that will shape their tactics in the future. Pakistan might use simpler means – e.g., converting commercial drones to drop munitions (as seen in Ukraine) – which could still immobilise a tank with a well-placed charge on the engine deck.

In general, lightweight Switchblade-type systems can loiter for 15-40 minutes with ranges up to 40km, providing persistent threat coverage over wide areas. Their minimal radar signature and silent electric propulsion make detection extremely difficult, while fire-and-forget capability—with wave-off functions—allows precision engagement of high-value targets.[32]

The era of MBTs hiding behind terrain features or treelines is also over; pervasive ISR means Indian tanks will be watched even before they enter the line-of-sight or communication range. Pakistan has a decent drone fleet for surveillance (German Luna drones, Chinese tactical UAVs) and extensive ground radars. China's ISR capabilities are even more extensive: satellites, high-altitude UAVs (like BZK-005),[33] ground reconnaissance units, all integrated in the PLA's network. Their doctrine of "Systems Confrontation" seeks to destroy key nodes – India's tank formations are a key node for its IBGs, and as per the PLA's doctrine serve as the prime target for multiple systems concurrently (drones, missiles, electronic warfare).[34] The concept of a "transparent battlefield" is thus very real for Indian tank units; any massing of armour would likely be quickly detected by adversary sensors, unless extraordinary measures are taken (night movements, radio silence, camouflage).

India can contest the littoral air-space using its own UAVs/UCAVs, electronic warfare and counter drone systems to disrupt Chinese and Pakistani anti-tank capabilities. But then, keeping MBTs alive and operationally viable demands ever increasing *resource commitments* that may exceed the operational value delivered by heavy armour. Policymakers and generals will need to determine whether the cumulative investment required to preserve the MBT's relevance in such battlefield conditions represents the most optimal resource allocation, given alternative

capabilities and platforms that might achieve comparable military objectives with greater efficiency and lower vulnerability profiles.

5.1 Evaluating Countermeasures

Given these threats, the Indian Army is actively seeking to bolster tank survivability. The Defence Research and Development Organisation (DRDO) had worked on a soft-kill APS for T-90, which did not reach fruition. Now, as noted, India is turning to the Israeli Trophy APS.[35] A recent Request for Information explicitly calls for APS with hard-kill, soft-kill, and anti-drone capabilities for all T-90 tanks.[36] An APS like Trophy can significantly improve odds: during tests, Trophy intercepted RPGs and ATGMs with over 90% success rate. On Indian tanks, a successful APS integration would mean many ATGMs could be nullified before impact. However, this isn't foolproof, as a saturation attack (multiple missiles at once from different angles) could overwhelm it. Very fast kinetics too, like APFSDS shells, can't be intercepted by the current APS.

Beyond APS, Electronic Warfare (EW) support will be a critical determinant for battlefield dominance. Indian Army units field some EW units that can jam radio links. An example: to counter drones, the Indian Army has inducted portable jammers (like DroneShield guns) and vehicle-based systems. The idea is to integrate such EW with tank units to confuse the guidance of incoming ATGMs. It can also sever the control link of a loitering drone, if it's not fully autonomous. Given China's heavy use of electronics, India must expect EW to be a contested domain – Chinese units might jam Indian communications or GPS, and Indian EW will try to do the same to their drones and missiles. In effect, MBTs survivability will partly hinge on who wins the EW battle in each sector.[37]

The threat environment doesn't necessarily make armour unusable, but it raises the cost of usage. The Indian Army will want to ensure that whenever tanks are employed, they're accompanied by suppression of enemy anti-tank defences – via artillery bombardments on ATGM teams, hunter-killer drones to take out ATGM positions, and aggressive reconnaissance to avoid ambush.

6. Economics of MBTs

In February 2024, several media platforms reported that the Indian Army is likely to issue a Request for Proposal (RFP) to produce 1,770 Future-Ready Combat Vehicles (FRCV) to replace the ageing fleet of T-72 tanks at an estimated cost of ₹57,000 crores, or US$ 6.5 billion.[38] This places the unit cost of each FRCV at about ₹32 crores, or US$ 3.6 million.

However, this cost appears to be a severe underestimation when compared to the past purchases/orders of T-90s tanks and Arjun tanks. The table below provides a cost comparison of projects over the past two decades.[39]

Table 2. Project and unit cost of various MBTs over the years

MBT Type		Year	No. of Tanks	Project Cost (₹Crores)	Unit Cost (₹Crores)
Arjun Mk 1		2000	124	Not calculated	17-45*
T-90S		2001	310	3,625	11.7
T-90S		2007	347	4,900	14.1
T-90MS		2012	354	10,000	28.2
T-90		2013	235	6,000	25.5
Arjun Mk II		2014	118	6,600	55.9
T-90MS	Initial clearance by DAC	2016	464	13,448	28.9
	Order placed by MoD	2019		20,000	43.1
Arjun Mk-1A		2021	118	7,523	63.8
FRCV		2024	1770	56,000	32

*By the time the last unit of Arjun Mk 1 was delivered, the cost escalated from ₹17 crores to ₹45 crores.

It is evident from the table above that under no circumstances can the unit cost of FCRVs be in the range of ₹ 32 Crores.

The Arjun Mk1A, India's indigenously developed MBT, is priced at approximately ₹70 crore (~US$ 10 million) per unit. Beyond acquisition, lifecycle costs—encompassing fuel consumption, spares, climate-specific kits, and the deployment of maintenance crews—impose additional fiscal and logistical burdens.

It is to be noted that the unit costs provided in the table above are mostly exclusive of various protection systems, including APS, that must be compulsorily installed to make MBTs more secure on the battlefield today. Thus, even discounting the cost for necessary accessories, the unit cost of various variants of T-90s and Arjun MBTs far exceeds the per-unit cost of proposed FRCVs.

Thus, modern MBTs represent some of the most resource-intensive assets in land warfare, with significant implications for procurement policy and force structure.

Domestic production capacity further constrains India's armour fleet: the defence industry is capable of manufacturing only a few dozen units annually (~30), and development timelines often extend decades – as illustrated by the three-decade Arjun programme.

Together, these factors have resulted in cost escalations on multiple stages of procurement, development and induction. Consider the case of 464 T-90MS which first received a clearance in 2016 at an estimated cost of ₹13,488 crores . By the time final approval from the cabinet came through, and the order was placed by the MoD in 2019, the cost for procuring and manufacturing 464 T-90MS had gone up to ₹20,000 crores.

The cost escalation isn't just limited to delay in placing orders, but are often embedded in the project cycles and schedule. A 2014 Comptroller and Auditor General (CAG) report highlights that by the time the last unit of Arjun Mk-1A was delivered in 2009 (delivery started in 2002-03), the unit cost had escalated by more than 2.5 times.[40] It notes:

> *"Despite the fact that the production schedule was shifted from 2002-07 to 2002-09, the Board could not produce on time, the quantity indented by Army. There was a slippage in production; production picked up only in 2006-07.The cumulative production of 122 MBT Arjun was still short of the indent by two MBTs which were under production and three MBTs were under inspection as of December 2013. The delays in production led to cost escalation by more than 2.5 times: from ` 17 crore per MBT to 44 crore."*

The examples above suggest that once initiated, MBT programmes also exhibit strong institutional and political inertia, with sunk costs and employment considerations making course corrections difficult. The Arjun's periodic shelving and revival exemplify this dynamic. Thus, as MBTs have become vulnerable in the evolving battlefield, the overruns aren't limited to just their increased costs but also project delays.

While it is true 'cost escalations' are *universal* across all platforms, MBT-associated cost escalations are worrisome for two reasons: First, the functions of MBTs are largely replaceable. Second, a majority of its added cost is disproportionately owed to improving its survivability in light of growing threats than to increasing its lethality.

In comparative perspective, many militaries are moving towards hybrid fleet compositions that balance small numbers of advanced MBTs with larger pools of lighter, cheaper, and rapidly replaceable assets such as Infantry Fighting Vehicles (IFVs) and unmanned aerial systems. For India, excessive dependence on expensive MBTs risks crowding out investment into such alternatives, raising questions about the sustainability and strategic prudence of its current armour modernisation trajectory.

7. Alternatives

In light of the above factors, the Indian Army must consider other platforms that can complement or substitute for MBTs or their functions. This section discusses some of the alternatives in this regard.

7.1 Light Tanks

Weighing ~25–35 tonnes, they trade protection for mobility and deployability. India's Zorawar (25t, 105 mm gun) is explicitly designed for high-altitude ranges.[41] It is air-droppable and amphibious, thus suited to mountainous and riverine areas. China uses the new Type-15 in mountainous deployments,[42] and Pakistan uses the Chinese Type-63/96 light tanks for desert and riverine operations.[43] Light tanks can keep pace with helicopters and artillery in rough terrain. Light tanks can also traverse weaker bridges and narrow mountain roads, enabling armoured fire support in border areas that were previously infantry-only. In jungle or island warfare, a lighter footprint reduces the risk of vehicles getting stuck or collapsing infrastructure. However, their thinner armour means greater vulnerability to heavy ATGMs and even larger mines. They also carry smaller ammunition loads and guns (Zorawar's 105 mm vs Arjun's 120 mm). This means light tanks must rely on stealth, mobility and combined-arms support. In high-altitude confrontations, perhaps both sides will have light tanks and they'll engage each other. In such a scenario, training, numbers and technological superiority might decide outcomes, since neither will have effective heavy armour. Against infantry with weak anti-tank capabilities (like insurgents or lightly armed foes), light tanks fare well, as they bring a big gun to bear with impunity – as long as there are no anti-tank surprises. Nonetheless, in the Himalayan context, light tanks offer the best armour/weight compromise.[44]

Lifetime cost: MBT vs Light Tanks

Across weapon systems, Operating and Support (O&S) – fuel, spares, maintenance, overhauls, crews – dominates life-cycle cost. GAO's 2024/2025 work pegs O&S Cost-Estimating Guide shows that O&S is typically the largest cost category. Heavier MBTs impose higher O&S per kilometer (fuel burn, track/engine wear) than lighter tanks, all else stands equal.

For India, the light tank is not a replacement for MBTs in Punjab or the Thar Desert – the Indian Army has been clear that it's a niche capability, and not something to equip all armoured regiments with. Its introduction will complement the force by adding flexibility. Another advantage is lifetime operational cost: despite a higher

initial cost of development and acquisition, presumably, a Zorawar will cost much less than an Arjun MBT,[45] so the Indian Army could procure them in decent numbers without breaking the bank.[46] This raises the possibility: could India simply build more light tanks and fewer heavy ones? To be clear, light tanks cannot face MBTs head-on, for a T-90 or Al-Khalid will outrange and destroy a light tank with a single direct hit given the opportunity. Thus, heavy MBTs would still dominate a battle in open terrain and massed warfare. But the odds can change against MBTs in a networked warfare. Light tanks, with support from combined arms can emerge as potent alternatives.

7.2 Infantry Fighting Vehicles (IFVs) and Armoured Personnel Carriers (APCs)

Vehicles like the Bradly (USA), BMP-2 Sarath (India) or BTR-80 (Russian) put 20–30 mm guns and ATGMs on tracks/wheels to accompany infantry. They offer high mobility and helicopter transport, but only light armour. IFVs protect troops against small arms and shrapnel, and their guns/ATGMs provide anti-armour punch (e.g. BMP-2's AT-4 Kornet missiles). IFVs can, in some situations, take on roles similar to tanks. For instance, in low-intensity conflicts or against irregular forces, a 30 mm cannon might be enough to destroy enemy vehicles, destroy fortifications, or suppress enemies, thus obviating the need for an MBT. IFVs also have mobility similar to MBTs and often better speed. They can operate in places tanks can, plus in places tanks can't (they are lighter, 15-25 tons typically, so can cross lighter bridges or be airlifted more easily). Modern IFVs are being up-gunned,[47] (some have 50 mm guns planned, and often carry ATGM launchers like Kornet or Spike) to engage armour at range. As seen in Ukraine, in a pinch, IFVs could ambush a tank and destroy it with ATGMs.[48]

Indian plans for a new Future Infantry Combat Vehicle (FICV) might include a modern ATGM and better armour on the IFV. There is also the angle of using

"wheeled gun systems". India has not fielded any yet, but could consider something like the Centauro (8x8 with 105 mm) as a medium armour solution.[49]

Stryker

Washington approved India's bid to become the first foreign producer of Stryker armoured fighting vehicles in January 2025, breaking a decades-long restriction on technology transfer for this platform.[1] New Delhi potentially seeks thousands of Strykers, with most variants armed with anti-tank weapons while others handle reconnaissance and command roles. The decision coincides with India's urgent need to replace aging T-72 tanks, while avoiding the ₹32 crore/unit cost of the proposed Future Ready Combat Vehicle.

The Stryker's anti-tank variant mounts two Hellfire missiles that engage both air and ground targets, alongside additional weapons packages which the commanders can reconfigure – based on mission requirements. The platform also achieves speeds exceeding 60 mph, with a range of 300 miles on 53 gallons of fuel, enabling rapid repositioning across diverse terrain. This makes it suitable for India's two-front challenge, where rapid deployment between Pakistan and China borders demands exceptional strategic mobility. Ukraine's experience offers concrete performance data under modern combat conditions: Ukrainian forces achieved high combat effectiveness during the Kursk operation, with advanced thermal sensors providing tactical advantages for commanders seeking to detect enemy positions. The wheeled design proved particularly effective across challenging urban and rural terrain combinations.[1] However, casualty reports document 44 M1126 Strykers destroyed, five damaged, and seven captured as of April 2025.

The Stryker platform emerges as a compelling case study for India's broader armour modernisation dilemma. Indian trials produced mixed results for MBT replacement potential. The Indian Army advised against Stryker acquisition, following disappointing high-altitude trials in Ladakh conditions. Analysis identified systemic flaws in terrain adaptability, survivability under modern firepower, and thermal-resilience engineering across India's diverse operational theatres. General Dynamics has continued demonstrating upgraded variants with enhanced engines and amphibious capabilities to Indian Army officials as of August 2025. The Stryker's counter-armour screening capability could enable rapid response to Pakistani armour thrusts in Punjab, while maintaining mobility for Himalayan deployments against China. The platform faces direct competition from India's indigenous Wheeled Armoured Platform developed by Tata Advanced Systems and DRDO. This competition, and prevailing geopolitical and trade headwinds, will force a choice between proven American technology and concerted investment in domestic industrial capacity building in critical defence sectors.

Wheeled armoured vehicles have great road speed and lower operating costs. In peacekeeping, or rapid internal deployments, they're very handy (many Western armies use them for rapid reaction forces) and are reportedly exporting it to

Ukraine.[50] They also require less logistics (wheels easier to maintain than tracks). But off-road in India's likely battlefields (soft desert sands or irrigated fields), wheels can be inferior to tracks in traversability. Also, wheeled vehicles typically have less armour than MBTs; though there are heavy MRAP (Mine-Resistant Ambush Protected Vehicles,) they still can't take tank shell hits.[51]

However, IFVs fare poorly against MBT-sized guns and heavy ATGMs. Usually, IFV weapons cannot engage MBT frontal armour effectively, limiting their utility in high-intensity conflict. Protection levels, while adequate against small arms and fragments, remain vulnerable to tank guns and ATGMs. Their envisaged role is to enable mechanised infantry, not replace MBT firepower. IFVs excel in manoeuvre support and urban/border skirmishes, but cannot help breakthrough combined arms formations within enemy territory.[52]

Nevertheless, these shortcomings become apparent only when IFVs are stacked against MBTs in a face-off. On the battlefield, these shortcomings can be overcome with aerial and artillery support.

7.3 Loitering Munitions and Armed Drones

These have arguably been the most disruptive alternative. Loitering munitions are one-time-use weapons designed to find a target and crash into it, 'kamikaze' style. Examples include Israeli Harop and American Switchblade.[53] They can hover over the battlefield, searching for targets (ISR+strike). They negate the need for line-of-sight; even top-attack potential (modular warheads) is possible. Loitering munitions shine in threat engagement (suppress enemy anti-tank systems, strike command posts), and as force multipliers at low cost and in large numbers. They are highly effective in disruptively targeting armour (as in Ukraine), and freeing up or even replacing some MBT roles like flank security or recon. A lighter alternative without the possibility of friendly casualties, they perform best when in permissive airspace.

Loitering-munition swarms offer a doctrinal alternative to massed armour assaults. Instead of committing 50 tanks along a predictable axis vulnerable to anti-tank fires, a force can launch large numbers of low-cost, expendable drones to saturate defences – accepting high attrition to suppress and destroy armour, artillery, and air defences. The trade-off involved favours attacking forces; even if many drones are intercepted, losses will involve materiel rather than personnel, and surviving munitions can penetrate gaps in defences. This is attractive in terms of attrition exchange.

However, while precision strikes through drone swarms can degrade an opponent, they can neither seize nor hold terrain. Operational success will still require a ground manoeuvre element to exploit any openings that have been created by strikes to clear remaining resistance, and capture territory. Tanks, with their armour, often accompany that infantry to punch through barricades and provide close fire support (drones can do some, but limited payload means maybe a couple of small bombs, whereas a tank has a rack with dozens of shells). Also, drones are highly dependent on the electromagnetic spectrum – jamming or air defences can degrade them. If the enemy has a strong anti-drone defence, you can't rely solely on drones to do the job.

These shortcomings, relating to holding or capturing territory, can be overcome by use of light tanks, IFVs, APCs and similar platforms.

7.4 Man-Portable/Vehicle-Mounted ATGMs

Advanced ATGMs (Javelin, Spike, Kornet) are anti-armour alternatives.[54] They allow infantry or helicopters to engage tanks at many kilometres with high kill probability. They excel in countering armour, and are cheaper than tanks. Yet they have no protection or mobility: once they fire, a platform (vehicle or team) is vulnerable (at the very least, during the reloading or manoeuvring process). Their presence complements MBTs; doctrine pairs infantry armed with ATGMs with tanks in combat operations[55] (especially in urban warfare). Their low cost and disaggregated deployment provides an asymmetric edge against armour.

Javelin is a fire-and-forget missile with an imaging-infrared seeker. The operator locks the target, launches from cover (soft-launch), and the missile autonomously flies a top-attack or direct-attack profile. A tandem HEAT warhead fires a precursor to neutralise ERA, followed by a main charge to penetrate base armour – giving small teams day/night anti-armour reach without post-launch guidance. The latest FGM-148F variant improves multipurpose effects while retaining anti-armour performance.

7.5 Unmanned Ground Vehicles (UGVs)

Mostly experimental for now (e.g. Russia's Uran-9 with 30mm gun[56] or Israeli robotic safes). They range from light scouts to turreted platforms. UGV swarms could reconnoitre under fire or perform resupply in high-risk zones. UGVs score high on reducing risk to manpower, and can operate in high-altitude or NBC environments. But they currently lack reliability and autonomy for combat use. India's DRDO has showcased infantry-supported UGVs such as the Muntra.[57] Current UGV size limitations also prevent them from being able to subsume the role of MBTs when it comes to holding conquered territory.

A true unmanned tank (with equal firepower) would be a game-changer since one could take more risks with it, given that lives of the crew will not be at stake. But remote controlling a tank in the thick of battle is very challenging with the current tech (communication link reliability, AI to handle unexpected situations, etc.). Perhaps in a decade or two, more autonomous tanks could augment forces (some envision mixed manned-unmanned armoured platoons), but as of now, these cannot be an effective alternative to the MBT.

The following table offers a subjective assessment of various platforms that can either individually or in combination replace MBTs on the battlefield. Each parameter is awarded a relative score on a scale of 1-5. Better the firepower, protection (shield and armour) and mobility, higher the score. Alternatively, higher the vulnerability and cost, lower the score.

Table 3. Comparison of Various Platforms

Platform	Firepower	Protection	Mobility	Cost	Vulnerability	Total Score
MBT	4	4	4	1	1	14
Light Tank	3	3	5	3	1	15
IFV	3	2	5	4	1	15
Loitering Munition	5	4	5	5	3	22
UGV	3.5	3	4	2	1	13.5
Artillery	5	5	-	1	5	16

8. Conclusion

MBTs today appear to be platforms in search of a purpose. Designed during the industrial-age wars of the twentieth century, their roles and objectives have not meaningfully evolved since WWII, even as the very character of the battlefield has undergone fundamental transformation. The raison d'être for which MBTs were conceived—territorial conquest through overwhelming shock and manoeuvre—has steadily diminished in relevance. India's unique security environment, defined by nuclear parity with both Pakistan and China, further compresses the space for any punitive incursion or territorial seizure. Large-scale ground offensives, once the mainstay justification for heavy armour, are now highly constrained, if not implausible.

In this context, the continued emphasis on MBTs appears anachronistic. If the ultimate aim of punitive action is to secure leverage in a crisis, then modern technology provides with a spectrum of tools—ranging from precision strike capabilities to cyber and electronic warfare—that allow the same objectives to be achieved without incurring the heavy risks to soldiers' lives inherent in tank warfare. Unlike in the mid-twentieth century, MBTs are no longer the only credible instruments of battlefield power projection. Rather, they increasingly compete with

cheaper, lighter, and technologically more versatile platforms that can deliver results with greater efficiency.

A further limitation lies in the balance of numbers. India's fleet of roughly 4,000 tanks appears less formidable when compared to China's arsenal of nearly 7,000 MBTs and Pakistan's estimated 2,700. Parity through numbers is, therefore, unachievable and costly. Instead, India must rethink its force structure around asymmetric approaches that are more operationally sound and financially sustainable, to neutralise enemy armour without mirroring it. After all, defence expenditure in India is heavily weighted towards recurring revenue costs such as salaries and pensions, leaving only a fraction of the budget for capital acquisitions. The problem is further compounded by the imbalance in capital allocation within the three forces. The Indian Navy and Air Force are operating with platforms that are way below the sanctioned levels. In such a constrained fiscal environment, the sheer cost of maintaining and upgrading MBTs demands scrutiny.

Unlike other platforms whose modernisation translates into sharper lethality, the trajectory of tank development has been skewed towards protection. The bulk of recent investments have been funnelled into adding layers of armour and active protection systems to shield MBTs from proliferating threats such as drones, loitering munitions, and anti-tank guided missiles. Yet paradoxically, this very quest for survivability has rendered them bulkier, slower, and prohibitively expensive. In effect, resources are being channelled into preserving the tank itself, rather than enhancing its offensive capacity. It is a bizarre trade-off, where lethality stagnates even as costs escalate.

Proponents of MBTs offer counter criticism by pointing to the flawed strategies and poor employment practices that have led to tank losses in recent conflicts. Yet, this is less a robust justification than a post-facto rationalisation to sustain their relevance. The deeper question remains unanswered: what is it that immensely expensive MBTs can achieve today that cannot be accomplished by alternate platforms and strategies?

With threats becoming lighter, cheaper, and more numerous – the cost-benefit balance tilts heavily against tanks.

Indeed, there is a growing risk that MBTs will become the proverbial white elephant – too costly to abandon, yet increasingly ill-suited to the battlefield. Nostalgia plays a powerful role here. For much of the twentieth century, MBTs were not merely machines of war but symbols of power, prestige, and military might. This aura endures, shaping perceptions in militaries worldwide. Yet, nostalgia cannot dictate doctrine. The role of MBTs today requires rigorous strategic evaluation. Doctrinal and procurement choices must ultimately rest on an assessment of contemporary battlefield realities, rather than on the enduring image of MBTs as icons of past military strength.

The evolving battlefield offers stark lessons. Modern conflicts—from Ukraine to the Middle East—underscore the vulnerability of tanks to low-cost precision systems. Drones, top-attack missiles, and networked reconnaissance assets have exposed MBTs as slow-moving targets in theatres, where agility and dispersal matter far more than sheer armour. Rather than restoring the MBTs' place, technological evolution has accelerated its redundancy. In India's case, persisting with MBTs at scale risks tying resources to a weapon system that is steadily losing both purpose and survivability.

Ultimately, India's military doctrine must evolve in step with the changing character of war. This does not demand the wholesale abandonment of armour overnight. MBTs may still find residual utility in niche roles, but it does require shedding the illusion that they remain the centrepiece of future wars. In a security environment constrained by fiscal limits and dominated by nuclear parity, the search for leverage must shift decisively towards asymmetric, technology-driven strategies.

But on the modern battlefield, they are increasingly akin to sitting ducks – trapped by outdated objectives, rising costs, and growing vulnerabilities. For India, the prudent course lies not in clinging to the past but in embracing the future; investing

in the tools and doctrines that reflect twenty-first century realities, rather than those that hark back to wars of a bygone era.

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