Philosophy of Modernisation: Indian Mechanised Forces

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Introduction

The future of the main battle tank (MBT) is an issue that has attracted considerable attention over the past few years, especially since the end of 1990-91, First Gulf War. The MBT as a concept was developed following the end of World War II, being a fully-tracked armoured vehicle equipped with a turret mounting a medium calibre, high velocity, quick-firing gun. Countries attempted to develop tanks with high velocity guns to match other armoured vehicles on the battlefield and sufficiently well balanced to provide good protection and mobility. Each country was searching for a design which provided the optimum balance between firepower, mobility and protection at acceptable costs. The line of development was, thus, set for the next 40 years or so with the majority of countries pursuing the same basic concept of a balanced design, tempered by their past experience and philosophy of operations.

Today, the world has entered the genre of third generation MBTs, also referred to as the 'digital tanks'. The French Leclerc, the American M1A2 and the German Leopard 2A5 could be construed to operate in the digitised sphere. In the Indian context, tanks have been employed in almost all regional contexts so far. In order to facilitate design, development, production and acquisition of the full range of weapons and equipment for the mechanised forces, to keep these relevant and contemporary at all times, modernisation, juxtaposed with the attendant philosophy behind the arm modernisation is undertaken in synchronisation with the force development capability that is envisaged.

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Operating Environment

India's rising comprehensive national power status of a regional superpower on the starting block makes it an important pillar of stability within the region and the world. Such status must take into consideration the changing geo-strategic environment and emerging security challenges which entail expanding our sphere of influence to protect and further our strategic interests in the Indian Ocean Region (IOR) and even beyond. Geo-strategic compulsions may, thus, dictate tasks for out of area contingencies (OOAC), which could be supportive, interventionist, or preventive in design. The need is, thus, well established to evolve a strategy and force capability for the mechanised forces to remain 'ready and relevant' at all times i.e. ready in the context of our present operational tasking and relevant from the point of view of our national aspirations and dynamics of the future geo-strategic environment. This mandates a threat-cum-capability-based approach for our force structuring. With the 'greening' of our immediate borders, future battles are likely to be fought in terrain akin to the developed, whilst seeking high value targets in a limited time window. Mechanised forces would need to adapt to fighting in built up areas, with high density vegetation and water channels. There will, therefore, be a need to equip our present generation of armoured fighting vehicles (AFVs) with urban fighting and survival kits. However, there would remain the need to retain the ability to operate in the low hills enveloping our northern borders, riverine terrain of the Western and Eastern Theatres, as also amphibious operations in the island territories and coastal areas of our adversaries.

As more and more inhospitable terrains are made habitable and communications are improved over mountainous regions, the mechanised forces will find an increasingly potent role on the northern and eastern borders.

Conflict Scenario Mechanised forces have a significant participating role in asymmetric and fourth generation warfare. Asymmetric warfare encompasses a wide scope of theory, experience, conjecture, and definition—the implicit premise is that asymmetric warfare deals with unknowns, with surprise in terms of ends, ways, and means. The modern battlefield demands that wars be fought in all seven dimensions: space, cyber, air, land, sea, sub-surface and human mind. Suitably protected reconnaissance vehicles with trained manpower can function as rapid action forces to react quickly to such threats manifesting themselves in

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Developmental Kaleidoscope

A two-man crew manning duplicated workstations may be the norm for new generation tanks. Crews are likely to be seated side by side in a capsule sheltered within the tank's hull rather than in the turret. Integrated vehicle electronics facilitate the reduction in crew. Situation awareness will be preserved through optical and electronic sensors providing an indirect panoramic view to compensate for the loss of top vision. High-tempo, 24x7 operations will be standard and tanks will be able to digitally download tactical information to own forces. Information supremacy will permit tank crew to get inside an enemy's engagement cycle, allowing themselves first shot kill probability. The expanded battlefield will mean dispersion of assets and digitisation will enable control of these resources for maximising the concentration of effort.

Low-slung silhouettes of future MBTs with reduced-size turrets will make for harder targets. Armour will not be as heavily concentrated on the frontal arc and cater to anti-tank guided missiles (ATGMs) with fire and forget profiles. Composite armour in modular, replenishable form will be *de rigeur* for future MBTs. Future tanks will be protected by electronic armour. The basis of this technology exists in the shape of laser-warning detectors fitted on some tanks. Defence aid suits (DAS) that incorporate soft-kill and hard-kill technology will be in service shortly.

Affordability and development of key technologies has become a major factor in the development of a future tank while, at the same time, modernisation and incorporation of features that can overcome the challenges of the future battlefield cannot be overemphasised. It is highly unlikely that a single nation will be able to conjure the effort to develop a brand new tank in the future. Nations that until recently had ambitious acquisition plans are being compelled to either shorten their wish lists or indulge in upgrades.

Some components have been developed by innovators in such a manner that upgrades may be induced at a later stage. In addition, the concept of modularity

facilitates a common weapon platform to suit adaptability in different conflict spectrums. The aspects that can be subject to modernisation in a weapon platform are as under:

- Turret and associated assemblies.
- Hull and associated assemblies.
- Power pack, transmission and suspension—improved power-packs with a minimum power to weight ratio of 25:1 are required for both MBTs and infantry combat vehicles (ICVs). The power output of MBTs and ICVs should be in the region of 1500 and 450 bhp respectively to provide better battlefield agility. State-of-the-art transmission systems should be provided in the MBTs as well as ICVs, and have automatic/semi-automatic transmission. These are required for the ICVs in order to minimise crew and stick fatigue and provide a stable platform during firing.
- Gun, stabiliser and recoil systems: The stabiliser system on future AFVs should have ruggedised components, thereby providing a stable platform, stabilised in all three axes, to enable engagement of targets effectively at maximum stand-off ranges in all weather conditions.
- Ammunition, fire control equipment and night sights: Palletisation and standardisation of calibres, packaging and provision of mechanised handling devices for better management of ammunition is catered for. Thermo-baric and APAM ammunition for both MBTs and ICVs needs to be developed. The MBTs and ICVs should be fitted with advanced fire control and thermal imaging night sights to engage targets using the maximum stand-off ranges up to 3,000 metres for the main gun and up to 5,000 metres for missiles. The tank and ICV commander, for all round observation, must have an independent wide angle (panoramic) surveillance TI sight.
- Armour (protective materials): This enhances survivability on the battlefield. With the onboard laser warning and other protection systems with suitable dispensers catering to electronic counter-counter-measures (ECCM) the requirements of being illuminated by millimetric wave radars of incoming third generation missiles would be incorporated. Additionally, multi-spectral camouflage material, including thermal, radar and laser absorbing paints and mobile camouflage system would be provided in future AFVs. Fitment of add-on or modular armour protection is being planned and designed on the MBT so that all operational contingencies may be effectively tackled. Nuclear, biological, and chemical (NBC) protection systems are to be incorporated to facilitate operating in contaminated areas. The identification friend or

foe (IFF) system to obviate fratricide would be incorporated. The battlefield management system (BMS) to discriminate enemy from friendly locations is being incorporated.

- Communications: Secure, reliable, fool-proof communication integrated in an intense electro-magnetic and hostile electronic warfare (EW) environment would virtualise the mechanised forces. It must migrate from voice predominance to simultaneous and near real-time transmission of data and video to disseminate information essential for battle-field transparency.

Mobility

Mobility represents a "quality or capability to move from one place to another, while retaining the ability to fulfill primary mission. To facilitate this aim, the mechanised forces will be so tailor-made and grouped, that dispersion is achieved within theatres of operation for maintenance of a higher tempo of against the adversary. Strategic, operational and tactical mobility will be ensured to meet with the task accomplishment parameters.

Firepower

The analysis of future operating environments reveals that fighting in urban terrain with narrow streets, basements, high top floors and roof tops would hinder the firepower of MBTs as they are limited by the traverse of the turret and the elevation of the gun. Firepower requirement to cater for both conventional engagements and fighting in built-up areas (FIBUA) is being planned. There is, thus, the importance of more lethal and more precise firepower. At present, the recoil forces of 120mm guns capable of defeating MBTs are too high to be safely mounted on a tactical vehicle operating in such an environment. Future combat vehicles operating in a hostile environment will need to be equipped with both direct and indirect fire systems with enhanced penetration capabilities. Missile firing capability through the main gun with common sighting systems, blast weapons such as fuel-air explosives and thermo-baric weapons represent the key for the conduct of urban warfare.

Protection

Protection represents one of the most important operational parameters of combat vehicles. It will be paramount to ensure that the protection level of crews is increased, since they will remain the most vulnerable link in the mechanised environment. Some protection will be obtained through "stealth, mobility and

dispersion." Increased levels of protection will be required from enemy direct and indirect fire as well as from anti-tank mines and weapons of mass destruction. In order to give the combat vehicles inherent capability to function independently in battle, they are being equipped with defensive aid suits (DAS) to provide them with reactive and active protection against both chemical and kinetic energy attacks. Ceramic and titanium, two materials capable of defeating both chemical energy and kinetic energy weapons, may be able to achieve not only unprecedented impact resistance but will also be more affordable for battlefield use as their cost continues to decline.

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Stealth represents a promising technology for protection. It is visualised that stealth will strengthen the ability to accomplish surprise, reduce overall force requirement and make troops less visible to an unsophisticated or disoriented enemy. It would be possible that tunable, multi-spectral coatings will be available which will allow the signature of key combat equipment to be changed according to its particular environment, achieving a 'chameleon effect'. In this manner, stealth technology would increase the ability of future combat vehicles to avoid detection and, thus, reduce the possibility of being engaged.

Equipment Philosophy

Equipment Policy Statement Equipment on the inventory of the mechanised forces is diverse in origin and spread across vintage and levels of technology. It is neither economically viable nor logistically possible to replace an entire fleet simultaneously, and replace equipment after its life-cycle. The 30:40:30 or the three generation model accepted and followed in the Indian Army also facilitates the equipment philosophy of the mechanised forces. This obviates the problem of the mass induction, deinduction and resultant retraining of manpower. The roll-on concept of equipment management is adopted and equipment is managed in the following format:

(a) Obsolescent technology (Gen I) - 30 percent
(b) Maturing technology mainstay (Gen II) - 40 percent
(c) Affordable state-of-the-art technology (Gen III) - 30 percent

The modernisation philosophy, in our context, addresses issues at different

planes simultaneously to afford force superiority over the adversaries. The following planes are being addressed:

- ***Life-Cycle Concept*** The total useful life of a combat system is dependent on its exploitation, intrinsic robustness and the number of overhauls that it is be subject to. The concept of providing greater combat effectiveness and enhancing mission reliability of the equipment is addressed. Upgrades such as system enhancement packages (SEP) are converged during overhauls.
- ***Impact of Emerging Technologies*** The gestation period for introduction and assimilation of technology indigenously is long. Hence, it may be prudent to go in for commercially off-the-shelf purchase of the state-of-the-art technology / equipment for short durations (5 to 7 years) to cover the gestation period.
- ***Exploitation of Obsolete Equipment*** Our army can ill afford to discard equipment as non-operable once it reaches technological obsolescence. Such equipment, duly refurbished, is considered for use in secondary roles away from frontline duties as logistics carriers or armoured carriers for counter-terrorist operations (including by para-military forces) / training.
- ***Original Equipment Manufacturer (OEM)*** Due to the various intellectual property right (IPR) issues, it has been found that the OEM route is the preferred route for integrating the upgrades. This route is adopted preferably to end up with a transfer of technology with Defence Public Sector Undertakings / Raksha Udyog Ratnas (PSUs/ RURs).

Mechanised Infantry

The current force profile of mechanised infantry battalions as part of the mechanised forces would be as follows:

- These comprise the bulk of equipment on the inventory as matured technology. Suitable upgrades to keep them battle effective are given impetus as per the modernisation plans.
- The FICV is the first of the major scheme that shall fructify as a 'Make Indian' project. The Indian industry is partaking in its development and the expertise gained shall then be utilised to produce the FMBT, again as a purely indigenous effort.
- The third generation fire and forget top attack missile system is being developed. The Defence Research and Development Organisation (DRDO) developed NAG missile propels India as a leading nation in the third generation anti-tank missile club.
- Induction of the light armoured, multi-purpose, high mobility wheeled

vehicles (LAM) for use as reconnaissance, surveillance and ATGM platforms for mechanised forces.

Indian Defence Sector

The Indian defence sector has undergone an evolutionary phase. This was about the period when the sector was opened for private sector participation, hithertofore reserved exclusively for the state under the industrial policy resolution. Thence on, there have been a number of forays advocating participation of Indian industry, both public and private, working with the Ministry of Defence (MoD) and DRDO towards building indigenous capabilities in the area of defence. It is now a conscious policy to nurture the indigenous industrial capability and develop a sustainable domestic defence industrial base.

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Capital procurement in India is advocated through the charter listed in the Defence Procurement Procedures (DPP) published last in 2008, reviewed periodically to accelerate the defence acquisition process, usher in transparency and enhance indigenisation towards modernisation of the Indian armed forces. In 2005, the Government of India (GoI) introduced the offsets policy, seen as an efficient way of building up defence industry capability and integrating it with global supply chain while providing self-sufficiency to the armed forces. The policy not only helps to acquire modern defence equipment, but also intangible assets like technology through co-development and co-production. From the government's perspective, defence offsets leverage buying power to create a defence manufacturing base that addresses the needs of self-reliance. On the other hand, from the private industry's perspective, defence offsets are used as a route to amalgamate in global defence supply chains in addition to self-sustenance of Indian armed forces. The DPP prescribes a minimum offsets obligation of 30 percent of the estimated cost of the acquisition in capital acquisitions, where offsets are applicable.

Indigenisation Efforts

Defence spending in India has been growing steadily in keeping with our aspirations of building operational capabilities. A major portion of the defence budget has been earmarked for capital acquisition and modernisation of the

defence forces. Presently, India is a top importer of defence equipment and it is visualised that by 2015, the imports worth would be Rs 80,000 crore. Since self-reliance is defined as the ability to develop the eventual capability to design, develop and produce systems locally, and to provide for security of supplies, the import tag must reverse in trend.

The Department of Defence Acquisition comprises the Defence Acqusition Council (DAC), headed by the defence minister, the Defence Procurement Board (DPB), the Defence Production Board and the Defence Research and Development Board. The DAC decides on the catagorisation of a particular scheme into either 'buy', 'buy and make' and 'buy and make Indian', all aimed towards indigenisation efforts. An extract of the DPP 2008, in the following two paragraphs amply substantiate the indigenisation issues.

Acquisitions Covered under the 'Buy' Decision Buy would mean outright purchase of equipment. Based on the source of procurement, this category would be classified as 'buy (Indian)' and 'buy (global)'. Indian would mean Indian vendors only and global would mean foreign as well as Indian vendors. Buy Indian must have minimum 30 percent indigenous content if the systems are being integrated by an Indian vendor. Acquisitions covered under the 'buy and make' decision would mean purchase from a foreign vendor followed by licensed production/indigenous manufacture in the country. Acquisitions covered under the 'make' decision would include high technology complex systems to be designed, developed and produced indigenously.

The provision of ToT to an Indian Public/ Private firm, for providing Maintenance Infrastructure, would be applicable for BUY category cases, where equipment is being bought from foreign vendors. The decision to apply this clause would be debated in the SCAPCHC meetings on a case to case basis and approved by DAC. In such cases, the foreign vendor would have to identify an Indian firm which would be responsible for providing base repairs (third line) and the requisite spares for the entire life-cycle of the equipment. The Indian firm to be selected would be from a list of public or private firms which would be specified in the RFP. These firms would be DPSUs / OFB / Raksha Udyog Ratnas (RURs) or any other firm as selected by the DDP. The RFP would spell out the specific requirements of ToT for maintenance infrastructure which could cover the production of certain spares, establishment of base repair facilities, including testing facilities and the provision of spares for the entire life-cycle of the equipment. Both the foreign and the Indian firms would be jointly responsible for providing the maintenance facilities and support for that equipment.

Conclusion

Future armies will need to be capability-based instead of threat-based in order to face both most probable and highest threats. Future contingency forces will require a high degree of strategic and operational mobility to be prepared to face the challenges of the future security environment. As most conflicts over the past decades have involved MBTs, modern armies can risk not having these as long as they have other combat systems that can target enemy armoured formations.

The resurgence in Indian industry today offers scope for greater involvement in the defence sector, due to the availability of requisite skills and infrastructure for undertaking defence production and research and development. (R&D). Over the last four decades, considerable resources have been invested in setting up the defence R&D infrastructure through which enhanced capacities have been achieved in the defence sector. Significant growth in the private sector has been witnessed, with many industries becoming global players. There has been a shift in the role of the private sector in the field of indigenisation from being suppliers of raw material, components, sub-systems to becoming partners and manufacturers of complete advance systems.

The Indian economy is expected to grow at 8-10 per cent for the next two decades. India's defence expenditure, which is 2.5 percent of its Gross Domestic Product (GDP), is going to increase in proportion with the overall growth of the economy. India is also fast developing into a defence industry manufacturing hub for world corporations eager to leverage this sector's proven skills in product design, configuration and customisation with creativity, assured quality and value addition. India, therefore, offers excellent opportunities, for domestic as well as foreign companies, to forge new alliances and partnerships in the form of joint venture, co-production and co-development arrangements in the defence sector. The private sector can today harness the available expertise in scientific and technological skills and also raise resources for investment in R&D, towards achieving the goal of self-reliance in the defence preparedness of the nation.