

TECHNOLOGY REQUIREMENTS OF THE INDIAN ARMY

Introduction

1. The apparent success of high technology weaponry in the ongoing wars in Iraq and Afghanistan, are indicative that the war is undergoing a profound transformation. Today, as in the past, technology is fundamentally changing the face and nature of warfare. The opportunities offered by these new or emerging technologies are boundless. There is a need to concentrate on those technologies that are important to the Indian Army for its modernisation requirements.

2. The Indian Army remains committed to self-reliance through indigenous developmental efforts. Indian industry over a period has grown in strength and today has the financial capability and the potential to become a partner in defence research and production so that it leads to a self-reliant defence industrial and technological base for the country. An overview of Indian Army's futuristic technology requirements are covered in the succeeding paragraphs. The requirements are dynamic in nature and this list needs to be viewed as an outline guide only.

Equipment and Technology Requirements

3. The following key program areas have been identified for the futuristic modernisation requirements of the Army:-

- (a) Battlefield Transparency.
- (b) Combat Systems.
- (c) Communication Systems.
- (d) Rockets and Missiles Systems.
- (e) Directed Energy Weapons.
- (f) Advanced Material Technology.
- (g) Artificial Intelligence.
- (h) Robotics.
- (j) Nano Technology.
- (k) Bio-technology
- (l) Non Lethal Weapons.
- (m) Combat Modeling and Simulation.
- (n) Nuclear, Biological and Chemical Warfare Defence.

4. **Battlefield Transparency**. Indian Army needs to exploit the advances in Information Technology for providing all weather surveillance, collation and instant dissemination of this information to facilitate increased battlefield transparency. The following systems will be required:-

- (a) **Battlefield Surveillance Radars and Weapon Locating Radars.** Battlefield Surveillance Radars and Weapons Locating Radars with capabilities to detect vehicles and personnel movement at varying ranges will be required for the Army.
- (b) **Unmanned Aerial Vehicles (UAVs).** UAVs with advanced sensors and weapons are going to dominate all facets of the future battlefield hence, the need to acquire the necessary UAV's expertise indigenously. These should be capable of carrying payloads such as weapons, SAR payloads, electro-optical devices, electronic intelligence and communication intelligence.
- (c) **Advanced Electronic Warfare Systems.** Electronic warfare systems have played a crucial role in recent conflicts. Various electronic intelligence, communication intelligence, Radio Emitter Location and Jamming Systems integrated with Command and Control centres will provide enhanced battle field transparency to the commanders.
5. **Combat Systems.** The combat systems such as battle tanks, infantry combat vehicles etc, are mobile protected platforms designed to defeat similar systems of the enemy. In future, these combat systems will require all-round protection against various forms of threats namely, enemy tanks, anti-tank guided missiles (ATGM), armed attack helicopters (AAH) and anti-armour mines etc. The technologies that the Indian Army will require are given as under:-
- (a) Develop improved and next generation small arm weapon system.
- (b) Develop a suitable light armoured multipurpose vehicle which combines the essential requisites of mobility, agility, protection, communication, navigation, stealth and observation for reconnaissance.
- (c) State of art night fighting systems.
6. **Communication Systems.** The following systems will be required:-
- (a) Integrated platforms to support voice, data, image, multimedia applications and networking.
- (b) **Real Time Secure Mobile Communication.** Real time secure mobile communication links are becoming the backbone of modern warfare. Though some progress has been made in the civilian sector, there is a need to catch up with military applications.
- (c) Indigenisation of critical components in satellite communication.

7. **Rocket and Missile Systems.**

(a) **Rocket Systems.** There is a need to develop rocket systems of the range of 120-150 km indigenously with reduced dispersion. The ranges could also be enhanced to 120-150 km by developing Multi Barrel Rocket Launcher (MBRL) systems in the 250-300 mm calibre class. Solid propellants with high specific impulse should be developed for achieving longer ranges with radar based Trajectory Correction Systems (TCS) and inertial navigation systems.

(b) **Missile Systems.** The aim is to develop missiles with longer ranges and higher accuracies for surgical strikes on high value strategic targets with minimum collateral damage. Anti missile active and passive seeker defence technologies be developed for supersonic cruise missiles, for short range missiles, long range sub-sonic cruise missiles.

8. **Directed Energy Weapons (DEW).** The needs of the Army in this field are as follows:-

(a) **Anti UAV Weapon.** DEW for engaging enemy UAV in the 8-10 km range capable of being designated and controlled by appropriate detection and tracking systems.

(b) **Precision Weapons and Dazzlers.** These should be developed for use by Special Forces/ Anti Terrorist forces to make operations swift and surgical with minimum collateral damage.

(c) **AD Weapons & Air Deliverable PGMs.** Air Defence weapons from ground based mobile platforms capable of engaging all kinds of projectiles like rockets, mortar/ artillery, UAVs, missiles, fighter aircraft, helicopters, PGMs and other stand off armament .

9. **Advanced Material Technology.** Carbon composites, advanced ceramics and metal matrix composites are going to be the main structural materials for the future systems. These will enable weapon platforms to be made lighter and tougher. These technologies would find their application in all weapon platforms and support systems, especially in tanks / ICVs, protection suits for armour/ personnel, missiles/ munitions/ war heads, artillery gun barrel/ loading/unloading/ firing mechanism, communication equipment/ systems and so on.

10. **Artificial Intelligence (AI).** AI is an inescapable need for numerous military applications. Some possibilities are in the following areas:-

(a) **Imagery Interpretation.** Image interpretation for target identification and classification. Artificial Intelligence techniques could automate the extraction of low-level map features from imagery.

(b) **Expert Systems.** Expert systems for diagnosis and maintenance of sophisticated weapon systems such as radars and missiles.

(c) **Intelligent Evaluation of Kill Zone.** Missile – target range and trajectory analysis for evaluation of kill zones and launch time and simulation to assist in qualifying missile performance in various environments.

11. **Robotics.** Robotic applications for the Indian Army are as under:-

(a) Robots can be used to assist troops in combat for tasks such as surveillance, reconnaissance, anti mine and anti IED role, urban area combat, casualty extraction etc.

(b) Robotic equipment can be used to provide precision targeting support, carriage of ammunition and accuracy. Camera equipped and shock-resistant platforms to fire the guns remotely are possible applications.

(c) Robotic vehicles equipped with cameras and weapons can be used to perform tasks such as limited / spot surveillance and reconnaissance etc.

(d) **Robotic Military Vehicles.** These vehicles are required for a variety of high risk jobs such as mine / IED clearance, obstacle breaching and route opening. Man portable, light weight robotic systems would be required for reconnaissance, surveillance and target acquisition missions for sub-terrain/ urban operations. Robotic vehicles are also needed for mine detection/clearing, obstacles breaching, clearing wire obstacles, placing explosives, tactical deception, direct fire and communication relay.

12. **Nano Technology.** The applications for Army in the fields of nano technology are as follows:-

(a) **Counter Terrorism Tasks.** Possible applications are unobtrusive micro audio bugs and video recording devices with high capacity data storage to plant at likely meeting places of terrorists, over ground agents and sympathisers, unattended micro ground or air sensors which can be placed in advance and remotely activated on required basis and micro sized energy devices which can power unattended sensors / audio / video devices and a host of other applications in remote areas or places which

require extremely light weight power sources like light weight man portable radars, missiles, UAVs and other systems.

(b) **Dynamic Camouflage**. Fabric of uniform would act as a screen for displaying terrain specific picture. Fabric would also have switch able surfaces (E.g. cotton and polyester) for comfort and bio – chemical gas detectors for chemical agent warning.

(c) Other nano applications could include extremely rugged and safe arming and triggering mechanism for appropriate weapon systems, solid lubricants for weapon systems at high altitude areas.

13. **Bio-technology**. Some of the biotechnology applications for the Indian Army are as follows:-

(a) The bio-technological R&D should be extended to bio friendly / green developments i.e. the development of biodegradable ammunition which causes minimum damage to the environment.

(b) Lighter food and fuel for carriage by individual combatants.

(c) Bio production mechanisms to enable soldiers to generate food, fuel and materials from raw materials in the field, allowing for extended operation in remote areas.

14. **Non Lethal Weapons**. Sub-lethal or disabling military technology is particularly suitable in an urban or complex environment. Some of the important areas of research in this field having applications for the Army are as under:-

(a) **Stun Grenades**. Low impact grenades which can stun or immobilize adversaries.

(b) **Optical Weapons**. Optical munitions to cripple sensors and dazzle, if not blind, soldiers.

(c) **Acoustic Weapons**. Weapons that emit sonic frequencies to cause such sensations as disorientation, debilitating dizziness and motion sickness or nausea, also generate vibrations of body organs resulting in extreme pain or seizures.

15. **Combat Modelling and Simulation**. Simulation advances will transform military planning and training. Today, virtual reality simulations can enable soldiers to train in high fidelity mock-ups, at substantial reduction in risk and spending. There is a need to exploit a range of tools and products that will

enhance the Army's capabilities in the domains of training, development, acquisition and decision support.

16. **Nuclear Biological Chemical (NBC) Warfare Defence**. Indian Army will require protection from Chemical, Biological & Radiological hazards as per the following:-

- (a) **Individual Protective Equipment (IPE)**. There is a requirement of developing common IPE equipment which can provide individual protection in all kinds of contaminated environment.
- (b) **Collective Protection**. Both fixed and mobile shelters should be portable, easy to assemble & pack, to give NBC protection in all types of terrain.
- (c) **NBC Detection, Alarm & Monitoring**. The equipment should be portable, sensitive and electromagnetic pulse hardened to accurately indicate the radiation dosages and chemical and biological contamination level in real time.
- (d) **Decontamination Equipment**. In future the technology should be developed to provide mobile decontamination station which can decontaminate A & B vehicles, equipment and persons in a "tramline" mode at a faster rates.
- (e) **Calculation of Nuclear Blast Parameters**. The equipment should be able to automatically calculate the various parameters of nuclear blast like cloud and cloud bottom angles, illumination time, flash to bang time for carrying out estimation of yield and to work out down wind hazard distance. It should lend itself to integration with meteorological sensors.

Conclusion

17. There is tremendous scope for industry to participate in the development and production of systems and technologies for the Indian Army. Barring a few major PSUs and some private industries, most Indian industries engaged in production of defence equipment have limited R & D infrastructure and spend little on R & D. There is, therefore, an urgent need for Indian Industry to develop a vibrant defence R & D and production capability to meet requirements of the Indian Army. The participation of the Indian Industry in the modernisation, collaborative research and development and equipping of the Indian Army will provide improved capability and also boost the Indian economy.