TRANSFORMATION IN MILITARY LOGISTICS

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Improvements of the weapons are due to the energy of one or two men, while changes in the tactics or the case of the entire process of transformation has to overcome the idea of a conservative class.

— A.T. Mahan

Battles are decided by the logisticians before they have even begun.

— Field Marshall Erwin Rommel

Military logistics has seen quite a few transformations since the technological revolution, specially in the field of communication and information technology. The main reason for this transformation has been the growing realisation that logistics is the key element of the war-fighting supply support and this has been amply demonstrated in almost all the wars that have been fought. What has, however, emerged in recent times is that with the revolution in military affairs (RMA), there has been a corresponding transformation in military logistics so as to keep pace with the RMA and provide commensurate logistics support to sustain the war-fighting effort in the changed geo-political power equilibrium. The evolution in logistics

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practices has been a continuous phenomenon and has been driving the logistics managers to ensure the required material support to sustain operations in both peace and war. The pace of transformation in military logistics has, however, been rapid in the post-Cold War period. Also, the transformation has been influenced by corresponding changes in the logistics practices of the civil sector.

The end of the Cold War has had a signalling effect on the overall geo-political equations the world over. New alliances have been emerging, resulting in something like a multipolar world order. That is not to deny the fact that as the sole superpower, the United States continues to dominate the power equilibrium and wields considerable influence in world affairs. Translated in military terms, this shift has affected the dynamics of recent conflicts and possibly the shape of future wars. Since logistics is intrinsic to any conflict, it is natural that there would be corresponding transformations in military logistics to meet the operational requirements. Some of the other factors that have influenced this transformation include the economic considerations whereby the armed forces have to ensure cost-effective measures to provide for the best value for money that a country spends on defence, albeit without compromising on the military preparedness.

A significant shift in military affairs has been due to the impact of information technology (IT). The advancements in computer science, communications and other IT sectors have resulted in RMA globally. Since military logistics is closely linked with warfare, this RMA has to be supported by a corresponding revolution in military logistics (RML).[1] The key to further operations would be to deploy a force that is defined less by size and more by mobility and swiftness. Such a force will be easier to deploy and sustain and

1. Mark J. O' Konski, "Revolution in Military Logistics: An Overview," *Army Logistician*, January-February 2000, pp. 23-30.

will rely heavily on advantages in stealth, precision weaponry and IT. Thus, the logistics pipeline must be shrunk, the load lightened and the closing time cut. The RML is not only central to preparing for future military operations; it is the fulcrum of efforts by military forces to balance readiness and modernisation. The RML has to focus on exploiting improvements in communications, business practices, reshaping command and control relationships to provide better utility of command and reduced logistics footprint. The RML is also about developing distribution technologies that facilitate rapid throughput and follow-on sustainment.

Tranformation of the US armed forces logistics began in 2001 with the RML concept which provided for a clear vision of the logistics changes required. Chief of Staff of the Army Gen Dennis J. Reimer, has clearly declared, "As I have said many times, there can be no Revolution in Military Affairs (RMA) without having a Revolution in Military Logistics (RML)." The RML included *six tenets* on how the armed forces will be supported in the future. These are, seamless logistics systems, distribution-based logistics, agile infrastructure, total asset visibility, rapid force projection and adequate logistics footprint.

Introduction of automation in various walks of life has made us conscious of the fact that for equipping and sustaining the forces, a very powerful tool has come into the existence. Modern technology has permitted the growing use of computers into logistics units. Latest communications have made it possible to pass the demands automatically through the whole chain of command and supply right down to the base depot. This enormously improves management capabilities and increases the speed of supply. Computerised stock control has made the handling of demands much faster than before and present the commanders with an immediate "read-out" of holdings and reserves at various levels. This information can be flashed into the computer monitors at all levels of commands. This will, in turn, help the operational commanders to correctly assess their requirements and supply positions in so far as their immediate needs are concerned. Thus, IT provides us with better tools and more reliable inputs for taking material related

decisions in both peace and war. The impact of this important shift has been far reaching in the management of defence logistics across the board.

The aim of this paper is to examine the factors leading to the transformation in military logistics the world over, with a special emphasis on the model adopted by the US and other developed countries, look at the greater role of the private sector as a preferred route by the armed forces to shed excess baggage and discuss their impact on the Indian armed forces.

NEED FOR CHANGE IN MILITARY LOGISTICS

Change is the only constant in nature. Change, therefore, in the field of national security and defence is something that needs foremost attention so that the requisite adjustments and change in strategy to deal with the implications of the changes taking place are made. On the other hand, military organisations are historically noted for their conservatism, besides the inevitable human inertia and the unwillingness to change. Admiral William Owens who retired as the vice chairman, Joint Chiefs of Staff, and went on to head the SAIC, the largest employee owned company in the USA, admitted, "*Military organizations, especially successful ones, normally resist change.*" [2] This conservatism is understandable since few prudent people would like to take chances in such a key area of human enterprise as national security and defence. The risks of errors in dealing with change can be momentous. The internal dynamic of traditionalist versus radicals in military organisations can destroy or encourage dissent, discourse and innovation acceptance. Incremental changes are the preferred route.

Equally important is to understand that change is both evolutionary and revolutionary, the latter less often. No doubt, more than 95 per cent of organisational changes are evolutionary. The resistance to revolutionary changes are indeed strong. Most organisational change consists of improvements, incremental steps to fix a problem or change a part of the larger system. Such variations are ongoing; there is no beginning or end point in this change process. Revolutionary changes, on the other hand, by

2. Admiral William A. Owens, *High Seas* (Annapolis: Naval Institute Press, 1995).

definition, can be seen as a jolt to the system. As a result, nothing will ever be the same again. Organisations that change their missions exemplify revolutionary change.

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Defence forces also require an internal consensus to change, as much if not more than the technology and socio-economic imperatives which necessitate change. At the turn of the century, technology and threats have both changed dramatically. This is forcing defence organisations to examine the doctrinal and organisational assumptions on which they have operated so far. This global development is also impacting on India's armed forces. The burden of tradition and resistance to change rests heavy on Indian defence organisations. The manner and extent to which they are willing to change will determine their success in defending Indian military interests in the future. Change in military organisations does not come about easily. Gen Starry, a former head of the US Army Training and Doctrine Command, has listed seven conditions needed for changing a military organisation. First, a mechanism is needed to identify the need for change. Second, reformers should share "cultural commonality of intellectual endeavour" through shared educational and training background. Third, there must be an effective spokesman for change. Fourth, there is need for consensus building to get a wide audience for new ideas. Fifth, there should be continuity of service amongst the architects of change. Sixth, a champion of change must be found at the apex of the organisation. Seventh, changes must be through rigorous trials and their viability demonstrated.[3]

Before one looks at the transformation of military logistics, it is important to examine the issue of core and non-core logistics functions. Where the military *per se* is concerned, it is easy to identify war-fighting capabilities as the core competency. However, in the case of military logistics, the difficulty lies in identifying the logistics services that should

3. Donn A. Starry, "To Change an Army," *Military Review*, 63, no.3, March 1983.

be retained as core military competencies. Core activities are those that would be undertaken inside an area of operations. Non-operational activities are activities associated with training and support that do not require military skills, are generally commercial or administrative in nature, and are not directly related to operational activity. Drawing from these definitions, non-core logistics functions can be described as non-operational activities, which military personnel are not required to undertake. Gradually, the armed forces are moving out of non-core functions globally.

MILITARY LOGISTICS SYSTEMS OF OTHER COUNTRIES

Transformation of military logistics has been almost a universal phenomenon in all modern militaries in the world. However, the extent and specifics of such a transformation have obviously been varied and guided predominantly by the security and threat perceptions of each individual nation. What has, however, been common across the board is the impact of the information technology revolution on the way armed forces have begun to model their logistics management. Perhaps the most visible model in logistics transformation has been the US experience in this field. Though the US model need not necessarily serve as a role model tailor-made for other militaries to follow in a straightjacketed method, it, however, offers a fair idea of managing logistics in the modern day conflict scenario where rapid deployment and sustaining mission oriented logistics will need a relook at the way traditional logistics management has been done so far. Hence, the US model is discussed in greater detail.

TRANSFORMATION OF MILITARY LOGISTICS IN THE USA

Logistics is the lifeblood of the armed forces. Changing how we fight influences changes in how we support. The US Chief of Staff of the Army (CSA) has stated, "The transformation objective is to field a force that is strategically responsive and dominant at every point on the spectrum of operations. American military might must draw on new technologies and strategies in

the 21st century. We must build forces based on revolutionary advances in the technology of war that will allow us to keep the peace by defining war on our terms.

"A future force that is defined less by size and more by mobility and swiftness, that force will be easier to deploy and sustain and will rely heavily on US advantages in stealth, precision weaponry and information technology."[4] The transformation challenges the armed forces to balance near-term readiness and force modernisation in an environment of increased missions and fewer resources. The logistics pipeline needs to be shrunk, the load tightened, and the closing time cut. At the joint level, change started with Joint Vision 2010 and focussed logistics. At the army level, change started with the RML. The RML is considered central to the preparation for future military operations and is the fulcrum of the army's effort to balance readiness and modernisation.[5] The transformation in the way the army is to be deployed in the future is the process of converting the army's focus and structure from a Cold War construct to a full spectrum combat force that is strategically responsive and dominant at every point of the spectrum of the conflict. It is more than technology, it is doctrine, training, leadership, organisations, material readiness, installations, and soldiers.[6] These changes are vital for an RML. The first wave of RML focusses on exploiting improvements in automation, communications, business practices, reshaping command and control relationship to provide better unity of command and reduced logistics footprint. The RML is also developing distribution technologies that facilitate rapid throughput and follow-on sustainment as the army builds up its future objective force.

4. Eric K.Shinseki, Congressional Statement on The Army Transformation, Statement presented to the 106th Congress, 2nd session, March 2000.
5. Charles S. Mahan Jr, "The Challenges of Fielding The Army's Objective Force," *Army Magazine*, October 2001, p. 128.
6. William Grisoly, "Army Tranformation," Department of the Army Transformation Office, Carlisle , US Army War College, February 1, 2002.

Automation

The RML requires more than just changes in technology. It teams technology with new support techniques and dynamic logistics doctrine. The precision delivery of combat service support (CSS) is anticipatory and provides significant efficiencies in both supply and distribution. To harness these economies, the armed forces must capture, process and manage the disparate data and communication systems that make CSS occur. At the heart of the CSS information system is the Global Support System –Army (GCSS-Army). This system is much more than a close combat coordination and CSS delivery information system. It integrates and fuses information from the factory to the actual theatre of operations, coordinating, expediting and managing the numerous activities in between. Performing these functions requires communications and interactions not only within and between command layers and theatres, but also between sister Services. Knowledge gives leaders the necessary awareness. Precise real-time knowledge of the disposition of their assets allows commanders to manoeuvre CSS assets as quickly as they manoeuvre combat elements, thereby shaping the battle. [7] The army continues to streamline its operations in both peace and in combat, and a passive approach to logistics is no longer acceptable. Waiting for support is not a strategy. GCSS-Army is an evolutionary logistics information system that builds on the functions and processes of existing systems to generate data, integrate databases, and fuse CSS information from external sources as necessary to execute the RML.

GCSS-Army software will be delivered in a number of modules, according to the particular function needed. Each module will have common components and share a common database. The maintenance module will facilitate maintenance management at all levels, from the organisation up, and provide maintenance management information to logistics staff elements. The property accountability module will capture accountable property data, build and track hand receipts, provide management data

7. Colonel Edward J. Shinko and Lieutenant Colonel Thet-Shay Nyunt, "GCSS- Army – Making the Revolution in Military Logistics Happen," *Army Logistician*, January- February 1999, pp. 85-91.

for cross-levelling, and eliminate excess. Ammunition and supply modules are designated for support organisations with supply support activities and ammunition supply units. The Integrated Material Management Centre (IMMC) module allows MMC-level users to 'see' and manage the stocks on the ground and in-transit in their support area. The management module will give commanders and staff officers visibility and management information for CSS assets in their areas of responsibility. Additionally, the management module will fuse information from non-GCSS-Army databases, such as the Standard Installation/Division Personnel System, Transportation Coordinator's Automated Information Management System II, and others as needed

A seamless logistics system that ties all parts of the logistics community into one network of shared situational awareness and unified action can be achieved only in an environment dominated by global, wireless, assured communications.

Communications

The revolution in military logistics will also require a dynamic new approach to logistics support. A seamless logistics system that ties all parts of the logistics community into one network of shared situational awareness and unified action can be achieved only in an environment dominated by global, wireless, assured communications. Many world-class commercial companies have reduced inventories significantly and now rely on real-time information, coupled with rapid transportation, to meet customers' demands. Substantial cost savings in acquisition, warehousing, packaging, and transportation have been achieved by reducing inventories. Much of their inventory is in motion in the logistics 'pipeline.' To manage their reduced inventories, these companies employ global, wireless communications systems that give them up-to-the-minute status on shipments and deliveries.[8]

8. Roger Houck and Williams Cousins, "Communications Technologies for the Revolution in Military Logistics," *Army Logistician*, January-February 2000, pp. 95-97.

In the future, by leveraging information technologies, logisticians will be empowered to provide the right support at the right time at the right place. They will no longer rely on 'historical' data. Rather, they will have real-time, predictive information to make intelligent decisions and optimise force readiness. Global wireless communications will provide soldiers the capability to reach and 'see' virtually anywhere on the battlefield or in the world. Today, some 700 communications satellites orbit the earth. It is predicted that there will be over 2,000 by the year 2010. The market for commercial use of global wireless communications, both voice and data, is growing exponentially. Therefore, providers are scrambling to increase total capacity by putting up more satellites, and to increase the speed of information flow by improving technology. Competition for market share is driving down the size and cost of mobile equipment, while battery life is increasing steadily.[9] These communication systems are being developed for a global commercial market, but have broad applications for military use at the strategic, operational, and tactical levels. These technologies can provide the capability to receive, transmit, store, and retrieve information in a single seamless logistics system supporting a modern force in tomorrow's army.

Best Business Practices

Methodologies and applications used in private industry that elevate a commercial enterprise above the competition are referred to as "commercial best practices." Best practices enable leading-edge organisations to deliver world-class standards of performance to their customers. These best practices and standards of performance have generated much interest within the army logistics community, which is constantly being asked to do more with less. The emergence of commercial best practices took place because of downsizing and a hunger for profitability, or doing more with less, so it stands to reason that there could be a great deal of benefit to army implementation of these best practices

Leveraging of commercial best business practices is a popular topic in the literature and presentations concerning the army of the future,

the RML, and the Objective Force. The RML, as a precursor and roadmap to the Objective Force, could be accelerated greatly by investigating and embracing many commercial logistics best practices. Integrated supply chain management, the industry's changing view of logistics, electronic commerce, automated identification technology, direct vendor delivery, load optimisation, outsourcing, and smart simple design are all examples of commercial best practices that could be very useful in helping the army achieve the RML.[9] The Army Material Command (AMC) will transform into a more responsive Army Support Provider (ASP). This ASP will ensure: sustainability is designed into future systems with enormous improvements in reliability, availability, and maintainability; a single command, control, communication, computers/information and technology (C4/IT) architecture provides logistics information at all levels; centralised contracting information is always available; and, embedded. [10]The next few paragraphs will briefly discuss the emerging trends, capabilities, and best practices of commercial firms that perform the logistics function and move assets and information throughout the supply chain. The parallels with the RML and the army's modernisation of business practices and information technologies are striking.

The scope of supply chain management includes the supplier's supplier and the customer's customer. In recent years, supply chain management software providers and consultants have emerged as a multi-billion-dollar industry.

Integrated Supply Chain Management

The Massachusetts Institute of Technology defines integrated supply chain businesses management (ISCM) as a process-oriented, integrated approach to procuring, producing, and delivering products and services to customers. In

9. Robert D. Paulus, "Industry and Logistics Transformation," *Army Logistician*, July-August 2001, pp. 39-40.

10. Paulus, Ibid., p. 96.

this context, ISCM has a broad scope that includes suppliers, customers, and internal information funds flows. Thus, the scope of supply chain management includes the supplier's supplier and the customer's customer. In recent years, supply chain management software providers and consultants have emerged as a multi-billion-dollar industry. The information technology and software solutions offered by global vendors, many of whom have Fortune 500 client lists, offer the tools, visibility, and connectivity to facilitate supply chain management, integration, and optimisation. Supply chain management solutions have been most successful when a holistic, end-to-end approach is employed and when processes and information are integrated throughout the enterprise.

Implementation of software to manage the supply chain must integrate many different processes, including supply and demand planning, transportation and distribution management, and advanced planning and scheduling (for asset management or manufacturing operations). This approach can result in inventory reductions, increased on-time deliveries, reduced total product cycle (make-to-sell) time, increased revenues, and better customer service.[11] All of this adds up to significant savings and an important gain in competitive advantage. Applying tailored, integrated, enterprise-wide business process management software suites when implementing supply chain management techniques is creating a growing revolution in corporate-wide logistics management. This holistic approach is revolutionising corporate-wide logistics management. Many companies are promoting their logistics chiefs to executive vice presidents and senior vice presidents. Senior logisticians are being included as members of executive committees. This trend illustrates the institutionalisation of the value of logistics to the bottom line. Likewise, use of the logistics matrix in the corporate suite for planning and policy decision-making is also increasing.[12]

11. Helen Keeler, "Transformation Office Calls For Cultural Changes, Possible Acquisition Shifts," *Defense Daily International*, November 30, 2001, pp. 1-5.

12. Keeler, Ibid., p. 2.

Electronic technologies and applications have expanded to affect many aspects of logistics. US companies have used electronic commerce to increase productivity as they enhance business transactions, data and information exchanges, business process reengineering, organisational changes, and process automation.

With increased ability to handle tremendous volumes of transactions and the ability to amass, analyse, and control large quantities of specialised data, organisations have improved efficiency and accuracy and reduced costs, while providing faster, more reliable, more convenient services. These capabilities and the concomitant benefits will be further enabled by rapidly developing intelligent agent technologies that greatly enhance information filtering, search, retrieval, and off-line delivery. Electronic commerce and the sharing of information among entities and organisations facilitate vendor-managed inventories (VMI), paperless contracting, collaborative forecasting, and workflow management.[13] Through VMI, suppliers can control inventory and replenishment, as well as manage forecasting for improved customer service and increased inventory rotations. With VMI, suppliers can generate more accurate forecasts, which can lead to better production scheduling and reduced operational costs.

Electronic catalogues post product information on the internet. Many sites offer interactive capabilities such as on-line ordering. Internet purchasing and electronic catalogues are being used to streamline order cycle times, cut administrative costs, and speed up product delivery to the customer. The ability to order supplies over the internet can reduce cycle times drastically throughout the supply chain. This means that a low-cost, web-based, distributed procurement and resupply system can be delivered by standard web browsers.[14]

Automatic identification technology (AIT) includes bar codes, radio frequency (RF) tags, satellite tracking, 'smart' cards, and laser cards.

13. Larry Smith, "Commercial Logistics Best Practices for the Revolution in Military Logistics," *Army Logistician*, January-February 1999, pp. 137-141.

14. Smith, Ibid., p. 138.

Industry has found that to have successful implementation of these best practices, which would have system-wide impact and/or result in extensive change, it must also have the top leadership's commitment, support, and involvement.

Commercial-off-the-shelf (COTS) satellite tracking provides real-time monitoring of transportation assets and customer products. Bar codes, the most widely used form of AIT, and the visibility they provide, have enabled a great deal of the agility found in today's world-class manufacturers and retailers. The visibility of goods and assets in storage, in transit, and in process has resulted in reduced inventory levels and order and ship times, and improved overall responsiveness to customers.

Outsourcing non-core competencies is a recognised best practice. The reasons for outsourcing logistics functions include lower costs, a streamlined labour force, access to top personnel, and cutting-edge technologies. According to the Outsourcing Institute, 85 per cent of companies now outsource work they used to do in-house. The key reasons to outsource a function are cost and performance. Third-party logistics providers can leverage their core competencies to improve enterprise-wide performance. They provide significant economies of scale through their specialisation. By partnering with world-class providers of logistics services, companies dramatically improve service, profitability, and response times. The key to some of the best practices found in world-class organisations is an integrated information system with total, real-time asset and activity visibility. The technology and expertise currently exists to leverage best business practices into army operations and execute the RML. Industry has found that to have successful implementation of these best practices, which would have system-wide impact and/or result in extensive change, it must also have the top leadership's commitment, support, and involvement. The army Objective Force cannot be successfully supported with the resources and infrastructure that are currently projected. We need best-in-class logistics practices. The army must partner with world-class logistics providers when appropriate and become a world-class

provider itself by leveraging the best industry has to offer. The challenge is to determine where and when to pursue each of these industry-proven strategies.

Infrastructure and Reduced Logistics Footprint

The RML requires increased agility in a number of dimensions. Army logistics will have to become more agile structurally, physically, and mentally in order to cope with the demands of dynamic RML support to the agile and mobile forces of the Objective Force, the goal of the current RMA.

Structural agility will be accomplished through total integration of all army components, as well as incorporation of support teams from other Services, allies, and the army's partners in industry to meet the demands of specific missions. Teaming and task-organising are key RMA skills that apply especially to RML support forces. Logistics task forces need to be able to scale up and down in size, as well as in technical expertise. Personnel, teams, and units from all components should be capable of deploying and moving independently to an in-theatre rendezvous location. Active and reserve component units must be ready to accept, employ, and, in some cases, support Department of the Army (DA) and Department of Defence (DoD) civilian augmentation, as well as contractor personnel and equipment. All must be prepared to integrate with allied and host nation support organisations.[15]

Physical agility enhances the ability to deploy and manoeuvre the operational infrastructure of the distribution-based logistics system. Distribution-based logistics depends on an integrated, inter-nodal network of information systems, distribution platforms, and automated materials-handling equipment. To keep pace with fast-moving Objective Forces and to stay one jump ahead of an opponent's long-range weapons, the logistics units and personnel operating this network must be able to manoeuvre the component systems and control the movement of the distribution platforms on the fly. And they must be able to do so without degrading the throughput of sustainment to the fighting forces.

15. O'Kinsky, n. 1.

Army logistics has risen to the challenge of the RML and responded with a viable concept, backed up by a plan that provides previously unheard-of levels of capability as well as previously unheard-of levels of efficiency and economy.

Mental agility refers to attitude. RML logistics is fast logistics. All logistics managers in the supply chain need to think several steps ahead, all of the time. Real-time, 24-hours-a-day, 7-days-a-week operations will be the norm. Organisations need to have staff for this tempo and train team members to work in such a fast-paced non-stop environment. Additionally, many of the initiatives in the revolution in business affairs that streamline and improve logistics, acquisition and financial processes, contribute to this new, heightened agility.

Acquisition agility is a key army goal in the RML. In order to keep pace with the fast changing demands of RMA warfare and RML support, the acquisition system must support rapid and flexible access to a wide range of commercial sources of supply. The agile acquisition system also will be crucial to designing, building, and fielding the advanced systems and modernisation packages that will make the Objective Force a reality. Reduced development cycles will provide state-of-the-art technology to our forces in the field at a price the nation will be willing to pay if we are agile enough to exploit it.[16]

Army logistics has risen to the challenge of the RML and responded with a viable concept, backed up by a plan that provides previously unheard-of levels of capability as well as previously unheard-of levels of efficiency and economy. But there always will be a limit to how small the logistics system can get without sacrificing support to the combat units and accepting too much risk.

Maintaining an adequate logistics footprint involves a number of things. First, is presence in the theatre of operations. In today's complex world, there is always a significant trade-off between capability and force protection. Commanders-in-chief (CINCs) are understandably reluctant to have any more soldiers and civilians placed in harm's way than is absolutely necessary.

16. Keeler, n. 2.

When the theatre force must be limited due to force caps, shortages in lift assets, or force protections requirements, cutting support forces is an attractive option. Unfortunately, these support forces are often the key to sustaining the dominant combat power of modern US fighting forces. Operational planners should be sensitive to the sustainable force level as well as to the total deployed force level. The readiness maintenance and enhancement capabilities of logistics support forces need to be considered when force packages are being designed. Future CSS units must enable aggressive reduction in the manoeuvre sustainment footprint with fewer vehicles and leverage reach-back capabilities. *Ideally, combat forces are empowered by logistics, not encumbered by logistics.*

Operational logistics infrastructure also assumes a new configuration in the RML. As envisioned in the Objective Force Operations Support Command (OPSCOM), the RML logistics support for an engaged CINC will be operationally, not geographically, focussed. This means that the CINC's logistician and the OPSCOM commander will command and direct forces, units, agency offices, and contractor operations on a global basis, all focussed on the CINC's operations. This will give the CINC and his OPSCOM commander great flexibility in moving work to workers and workers to work. However, care must be taken in sizing future logistics organisations so that when missions are moved to allow a reduction at one level of command, they are not given to organisations whose capabilities have been reduced under previous mission transfers.[17]

Maintaining a viable logistics infrastructure between operations is also vital. Today's logisticians throughout the army and DoD currently perform numerous essential tasks every day, efficiently, and with little fanfare. The ability to project a sustainable force at a few hours' notice is possible only through their constant effort. In the same way, institutions need to maintain and pass on a corporate memory and corporate culture to remain great. Army logistics does this well at all levels and in all components. However, the toll of

17. The Army Transformation Office, "Statement of Required Capabilities, Future Combat Systems," November 2, 2001.

the recent series of drawdowns has had its effect. In future sizing decisions, the viability of institutions to continue operations and develop leaders must be considered.

Creating an adequate logistics footprint involves more than structural change. It also involves the development and refinement of concepts, ideas, and material. The Army Training and Doctrine Command is using a series of war games to bring together senior defence policy-makers to participate in scenario-driven exercises and discuss critical strategic and operational issues that will shape the army. Product improvements and block material replacements will change the way the army develops, tests, acquires, and maintains equipment. There will be increased reliance on split-based operations to reduce the logistics footprint in the theatre of operations. The number and type of weapon systems needed by land forces in the battlespace to hold and dominate terrain will change, and so will the operational and tactical logistics requirements.

Resupply, maintenance, and other combat service support functions will be accomplished in completely different ways or in the relative safety of a rear-area or continental United States location. It is this relocation of functions that offers the greatest potential for reducing the logistics footprint in the theatre of operations.

Modularity and new commercial best practices will be leveraged to minimise the logistics footprint without sacrificing capability. Smart simple design, a commercial industry best practice, has reduced the costs, assembly, and manufacture cycle times. It has reduced the number of parts in commercial systems and increased the serviceability of these systems. Army acquisition programmes must emulate smart simple design or similar initiatives to improve manufacture, assembly, and serviceability. Weapon systems or major end items that have fewer parts and, thus, are easier to repair and maintain will require lower levels of inventory and fewer maintenance personnel to support them. Use of this methodology for army weapon systems could reduce logistics demands and contribute to an adequate logistics footprint.[18]

18. Roger Houck," Adequate Logistics Footprint," *Army Logistician*, May-June 2000, pp. 101-102.

Other potential contributors to a responsive and efficient logistics footprint include robotics, unmanned vehicles, intelligent agents, diagnostics and prognostics, smart/brilliant munitions, real-time communications, and fuel and energy efficiencies. Advanced robotics technologies will replace people in missions such as reconnaissance, material movement, and transport. The use of unmanned transporters may range from aerial vehicles to tanks.

Sensors, advanced information technology, diagnostics, and prognostics alone could have tremendous impacts throughout the army logistics system and are key components of the RML. The incorporation of prognostics in digitised weapon systems will drive the numbers of weapon systems, material, and maintainers required in the battlespace. The ability to predict system failures before they occur will improve repair lead-times and prevent failures during mission-critical operations. Parts that diagnose themselves and requisition their own replacements or needed components will reduce the number of soldiers involved in the supply process. Assured communications and tele-maintenance applications will allow the expertise, but not necessarily the expert, to travel. The increased speed of repair and the enhanced capabilities will reduce the number of weapon systems required for adequate lethality on the battlefield and in the inventory.

This lethality will be achieved through the use of smart munitions and lighter, ultra-reliable weapon systems, as opposed to the mountains of ammunition employed in the past. One-to-one or better kill ratios mean lower ammunition support requirements and fewer weapon systems needed to complete fire support missions. The incorporation of advanced materials, biomimetics (materials that mimic the properties of those found in nature), manufacturing technologies, and design methodologies will result in lighter, ultra-reliable systems. All of these will have an impact on the logistics footprint. Finally, fuel will most likely continue to be a significant part of the support burden faced by army logisticians. But with fewer, lighter weapon systems and advances in hybrid systems, this requirement will also decline significantly.

Adequate logistics footprint, as an RML tenet, is not just about reduction. It is about balancing the right size, the right amount, and the right knowledge to do the job in supporting 21st century operations. It is the result of a reduced logistics demand, more lethally efficient weapons, information technologies that focus directly on the war-fighter, a seamless logistics system that allows for streamlining redundant support functions and organisations, and a transformation from a supply-based to a distribution-based logistics system. The next section explores the concept of distribution-based logistics.

Distribution-Based Logistics

The operational concept of distribution-based logistics (DBL) relies on distribution velocity and precision, rather than redundant supply mass, to provide responsive support to war-fighters. It reduces the mass required to compensate for the lethal uncertainties of war by reducing uncertainty across the joint theatre. DBL rests on three pillars: visibility, capacity, and control.

Visibility: The acquisition of near real-time situational understanding, or visibility, has been a major objective of Force XXI. The army is continuing this effort, fielding the first digitised division in December 2000, to be followed by the digitised corps in 2004. The advent of the new Army Vision has only emphasised the need for improved visibility.[19]

Visibility can be grouped into three major categories. First, there is visibility of the supported war-fighting units, which includes the unit's prioritised requirements, the commander's priorities among units, and the current and projected commander's intent. Situational understanding of the supported unit is the most essential element of the visibility tenet, since the status of the war-fighting unit defines the logistic mission and establishes priorities.

The second category of visibility is logistic capabilities and constraints. The logistician must have real-time situational understanding of his own

19. Robert McKay and Kathy Flowers, "Transformation in Army Logistics," *Military Review*, September- October 2000, pp. 45-51.

capabilities and constraints. These include visibility of elements of capacity such as infrastructure, material systems, inventories, transportation resources, personnel skills and training, and the logistic implications of the situation.

The third category of visibility includes logistic requirements and priorities to the supporting organisations at the theatre and strategic levels. Conveying situational understanding to supporting logistics organisations, such as from the corps support command to the theatre support command or the Defence Logistics Agency, becomes increasingly important, particularly as the army loses autonomy to strategic-level providers, even within the theatre of operations.[20]

Army personnel reductions, extremely slow acquisition processes, and limited budgets for research and development (R&D) and procurement are making it very difficult for the AMC to accomplish its currently assigned tasks and missions.

Capacity: The logistics force must have the physical capacity to act on the knowledge provided by real-time visibility. This includes the array of material systems: the lean but adequate inventories; road, rail and facilities infrastructure; and skilled personnel. These capabilities include the material for physical distribution within the theatre and from the continental United States by military or private vendors. Enhancements to new and improved material systems such as embedded sensors and prognostics, are essential to anticipating logistic requirements.

Control: Some of the most important logistics modernisation efforts fall under the tenet of control. These include the tactical force structure of the brigade combat teams; the theatre support command; and the single seamless army logistics organisation, the Army Readiness Command. Control also includes the necessary doctrine (at the operational and tactical levels) and law, policy and regulation (at the strategic level). Control encompasses the expert leaders and artisans who apply logistic capabilities to satisfy prioritised operational requirements.

20. McKay and Flowers, Ibid., p. 45.

The DBL is the envisioned RML end-state. The DBL will comprise a system of innovative policies, doctrine and concepts; reengineered logistic functional processes; redesigned organisations; new material systems with embedded sensors and prognostics; advanced information, decision-support and command and control systems; and well-led, highly trained soldiers and civilians to operate and manage it.

AMC's Role in RML

The Army Material Command (AMC) is primarily responsible for the army's revolution in military logistics. It is responsible for sustaining the force, power projection, weapon system management, and technology integration. However, the greatest challenge will be whether the AMC can successfully change its culture to effect transformation. It must transition from being the "owner" of the army's material and logistics systems to being the army's "integrator." Army personnel reductions, extremely slow acquisition processes, and limited budgets for research and development (R&D) and procurement are making it very difficult for the AMC to accomplish its currently assigned tasks and missions, let alone effect an RML. Additionally, the base realignment and closures (BRAC) and reductions mandated in the first Quadrennial Defence Review (QDR) have also had a significant negative impact on the AMC's own organisational structure by significantly reducing its force structure. Continued limited resources, increasing OPTEMPO, and an unclear threat are exposing the chinks in the AMC's armour. It's time for a new approach. One possibility is leveraging support from other Services, our allies and from industry. To manage the increasing work load with reduced resources, the AMC has formed a general officer-led Overarching Integrated Product Team (OIPT) to develop options and recommendations for reengineering the AMC so that it will be capable of accomplishing the mission of equipping and sustaining soldiers. The OIPT serves as a "guiding coalition" of leaders charged with devising and implementing a strategy to effect transformation and make the RML a reality. However, the effectiveness of OIPT's recommendations may depend upon whether the

strategic leaders can adequately change the culture. This requires not only acceptance of the AMC, but also the acceptance of supported commanders in the field and their respective logisticians.

The army has transitioned from a threat-based force to a capabilities-based force. Presently, two divisions are converting to the new digitised Army XXI structure. Additionally, two "interim brigades" have been formed but are not operational and four additional brigades are planned to be converted. To support future contingency forces, the logistics system must become capability-based. The AMC commander has stated that his organisation must be "modular for flexibility, able to anticipate and predict logistics requirements sooner, have a total asset visibility, focus limited logistics resources at the point of need, and able to react faster than ever before." Moreover,[21] these functions must be synchronised with the rapid OPTEMPO of future operations.

UNITED KINGDOM

In July 2006, the UK Ministry of Defence (MoD) published an "Enabling Acquisition Change Report" document that reviews the current structures and processes in order to maximise the MoD's ability to deliver the key objective of "through life capability management." This document focusses on the costs and capabilities of equipment throughout its life. The report recommends the merger of the Defence Procurement Agency (DPA) and Defence Logistics Organisation (DLO) to form a new integrated procurement and support organisation. It was announced in October 2006 that the merged DPA and DLO will be called Defence Equipment and Support (DE&S).

SOUTH AFRICAN NATIONAL DEFENCE FORCE (SANDF)

Support to SANDF forces deployed in Africa is provided to a large extent by aircraft flying over foreign states. Although the countries have good diplomatic relations with South Africa, road and rail communications are not

21. Gen John G. Courn, "Logistics: Flexing Muscles for Army Transformation," *Army Magazine*, March 2001, pp. 11-12.

good. The magnitude of the logistical task is, thus, not to be underestimated. It is to the credit of the DoD and particularly the SANDF, that the logistics support provided is succeeding in keeping the forces deployed operational. Though the media coverage from time to time reports the results of poor logistics support, generally the SANDF has managed to adopt and adapt the military logistics system to the operational scenario.

In spite of its success in supporting its force deployments in various peace-keeping operations, it was felt that the overall SANDF logistical system and command and control in general has not been functioning well. As a result, the government announced that the organisation of the force needs to be restructured since the system introduced in the 1990s was based on business principles, and was not considered effective for the military environment. One of the weaknesses was the over-complicated logistics system. To its credit, the DoD published its logistical weaknesses in an unclassified form, stating that the main risk confronting the joint logistics services is in the field of maintenance and repair of facilities, vehicles and equipment as well as the lack of skills and experience of its personnel.

During 2005, the responsibility for the management of the SANDF property portfolio was transferred from the Ministry of Public Works to the DoD , for which the latter received R 845 million in addition to its R 22.4 billion budget for that year. During the financial year 2006-07, R 4971 million was spent on the repair and maintenance programme. In the Defence Budget Vote 2008, the amount added is listed as R 80 million for 2007-08, R 230 million for 2008-09, and R 200 million for 2010-11. The DoD / SANDF reported lack of funds to maintain its equipment, since there is a huge backlog in this respect. In specialised fields, there are serious shortages in logistics personnel. The Government of South Africa is considering allotting adequate funds to meet the logistics support to the operational units. The process of strengthening the logistics support system is high on the SANDF agenda. Towards this, automation in inventory management is being taken up on priority.[22] At the National Defence Headquarters, the logistics staff division will have a major

22. http:/209.85.175.104/search?-cache:TPCvIn Z: tq 14 j: https/ www.up.ac.za/ dspace/ bitsre…

role to play in acquisition of new equipment, the maintenance of it while in service, and the discarding of it at the end of its life span. Clearly, logistics is not only about the supply of material to the military for operations. It also includes the ability of the national infrastructure to equip, support and supply the military and to ensure that the transportation system exists to move the forces to be deployed, to resupply the force once deployed, and to extract the force after operations are completed.

NEW ZEALAND DEFENCE FORCES (NZDF)

Under the new guidelines, the NZDF needed to adopt an accrual accounting methodology and adhere to generally accepted accounting principles (GAAP), in that the New Zealand government would hold the force to the same financial and accounting standards as any public company. To conform to the government's reporting requirements, the NZDF would have to provide accounting information for virtually every asset it had but these assets were scattered across the globe and managed by different batch mode systems that had never been designed to communicate with one another.

In defence, probably the most important interface for finance is with the logistics system, says Derek Eade, financial controller for the NZDF. "That is where all the movements are. You have got huge amounts of equipment and people all over the world. You have engineering changes to the equipment, maintenance and repairs and in order for us to account for all this in a full balance sheet, our asset management capabilities had to improve a great deal."

NZDF officials understood that meeting the current and future needs of the force required more than patching the existing standalone systems. The NZDF needed a completely new start on a proven platform that would provide a foundation for a comprehensive, highly integrated financial and logistics system. Moreover, with the urgency demanded by military and humanitarian crises that were evolving ever more rapidly, NZDF officials understood that the defence organisation needed a system that was flexible

The supply chain management of such a diverse and huge inventory has to cater for storage, transportation and supply of serviceable items at the user location.

enough to support personnel from NZDF locations throughout New Zealand as well as from locations in the field, wherever they might be. The NZDF also needed team operational support, with one version of information that all the different parts of the operational team could access.

With these solutions requirements in mind, the NZDF issued a request for proposals and soon narrowed the respondents down to three serious candidates. The successful proposal met more than 90 per cent of the force's requirements with standard off-the-shelf software. Based on the formal evaluation process, the NZDF chose to adopt SAP software as the standard for its financial and logistical systems. Today, more than 2,500 NZDF users access the equivalent of the SAP, the enterprise resource process (ERP), from more than 40 sites across the New Zealand.

BELGIAN DEFENCE FORCES

The Belgian Defence Forces, in order to streamline their logistics management, adopted the integrated logistics information and automation system (ILIAS) in 2006. ILIAS provides a full inventory system, including multi-site optimisation, stock management and purchasing. These are integrated into maintenance to allow a "pull through" approach to the logistics chain. For management of foreign military supply cases, ILIAS has a standard built in and also contains a module for automated update of codification information of parts. ILIAS covers the entire work cycle for modifications, corrective, preventive and predictive maintenance, including cost and invoice facilities. With ILIAS, a strategic decision support environment is delivered, providing key information to the leadership, middle management and operational level.[23]

From the above, it is more than evident that armed forces the world over have either already gone in for increased automation in their inventory management,

23. www.visionwaves.com

including procurement functions or some of them are in process of doing so, learning from the experience of the advanced countries. This includes some of the smaller forces such as those of Kenya and Singapore to name a few.

Due to its peculiar security concerns and British inheritance, the military supply chain in India is quite complex. The sources of supply, the maintenance infrastructure and storage depots are scattered and diverse in nature.

DEFENCE LOGISTICS MANAGEMENT IN INDIAN SCENARIO

War, being a national effort, dictates a closer interaction and integration of national agencies and resources respectively, to achieve synergy in support of our combat echelons. This was amply demonstrated during Operation Vijay and Operation Parakram. Further, despite the commonalities in the system, equipment as well as their sources of supply and procurement, we lack a common logistics philosophy. Each Service has its own organisation structure, procedures, supply chain and distribution networks to manage its logistics needs. This has resulted in divergent approaches, and duplication in holdings, training and infrastructure. The fallout of these individual systems working in isolation is a lack of convergence and holistic approach to defence needs, resulting in sub-optimisation of resources and efforts.

In India, our defence forces are heavily dependent on imports for a majority of the hardware and associated spares. In fact, the imported items account for almost 55 to 60 per cent of the total inventory. For a major period since independence, most of the military equipment was sourced from the erstwhile USSR and now Russia and other Commonwealth of Independent States (CIS) countries. Presently, we are importing military equipment from a number of countries such as France, the UK, USA, Australia, Austria, Israel, Germany to name a few. Import from such diverse sources, with peculiar nomenclatures and codification regimes and special terms and conditions, add on to the supply chain management matrix. The indigenous sources are mainly defence public sector undertakings (PSUs), original equipment

manufacturers (OEMs), ordnance factories and other trade sources. The supply chain management of such a diverse and huge inventory has to cater for storage, transportation and supply of serviceable items at the user location. Further, the repairable assets have to be serviced and put back to use. The main concerns which affect both cost-effectiveness and responsiveness of this supply chain are inadequate communication throughout the supply chain, long lead times, huge inventory, user satisfaction, high supply chain costs, non-performing assets and unutilised items.

Due to its peculiar security concerns and British inheritance, the military supply chain in India is quite complex. The sources of supply, the maintenance infrastructure and storage depots are scattered and diverse in nature. Therefore, to maintain a high state of serviceability and operational preparedness, it is imperative to have automation in inventory management almost as a prerequisite. Also an effective communication and transportation network is the key to ensure deliverance of the right item at the right place in the right time and right quantity. Our armed forces have been in the forefront to recognise this aspect of logistics management well in time.

As regards the automation of inventory management, certain functions of provisioning and procurement were taken up almost as soon as computers were introduced in the country. However, these were specific to the requirement and almost standalone kind of modules. In the mid-Nineties, the three Services felt the need to have a comprehensive and integrated logistics management system.

Accordingly, the three Services individually launched their programme to have computerised inventory management systems. The Army Computerised Inventory Control Programme (CICP) was sanctioned in July 1994 to install an on-line inventory management system for the army. The first phase of the project was inaugurated in October 2002. The navy has its Integrated Logistics Management System (ILMS) which was the first ever automated systemised logistics management system of the armed forces. It was implemented in March 1997 and its mission statement stated, ''…reaching out for customers' delight through network-centric operations while cultivating total asset visibility."

The aim of ILMS is to achieve transparency and strengthen aggregate control, while reducing, if not eliminating, delay causing transaction specific controls. The total users number approximately 1,350 with additional 50 dial up users. The air force has commissioned its Integrated Material Management On Line System (IMMOLS) which is an ERP solution developed by Tata Consultancy Services (TCS). The project started in 1993-94. It took a long and arduous journey of thirteen years to operationalise the IMMOLS. But the Indian Air Force (IAF) is now owner of a truly ERP solution software application. IMMOLS is operationalised at all the self-accounting units across the IAF and was dedicated to the nation by the Raksha Mantri on October 9, 2006. The vision statement of IMMOLS reads, "Establish IMMOLS in the IAF to create and sustain e-logistics environment for cost and time effective e-management of logistics activities to effectively support current and future operations in the IAF."[24] The impact of IMMOLS has been to create total asset visibility, providing a quality tool, standardisation of business processes, and inventory carrying costs. IMMOLS also provides for a centralised spares data bank, price history, on- line audit (EQUOLS & AUDOLS) and visibility, and accountability. It enables optimal inventory holdings, effective AOG/ demand management realistic provisioning, dynamic supply status and on-line concurrence and transactions.

Another area of concern is the need to have total asset visibility (TAV). In a military supply chain, asset visibility is of paramount importance as it provides a ready-made input for commanders to take timely decisions. Asset visibility encompasses inventory in motion, including controls during the transit of an item of equipment that are supposed to allow the sender and receiver to know the location and status of specific items in that inventory at any time. It is an accepted fact that efficient and effective management of inventory throughout the supply chain significantly improves the ultimate service provided to the troops. This implies a high degree of assurance and responsiveness, inventory control, asset placement, speedy restoration to serviceable state of the repairable stock and casualty evacuation.

24. IMMOLS Project Team Presentation Slide on Vision Statement.

Another well established practice increasingly being adopted by all major armed forces is the preferred option of shedding excess logistics baggage to service providers, especially in non-core areas.

Now, with the availability of more accurate means of computer-based simulations and intelligence, it is possible to make more efficient logistics plans, and forecast the distribution pattern much before any operation is undertaken. In a computer-based system, the "resource manager" can evaluate and provide various options to the commander. He can also give an objective opinion. For an operational commander, the basic issue is that of responsiveness from its logistics elements.

In an environment of shortages and deficiencies in equipping our forces, the "asset vision" will be used as a medium for the commanders to develop and evaluate plans where the effective and innovative use of resources can influence decisions as much as the dictates of the operational situation. This will be particularly useful in the case of specialists and maintenance engineers where a higher commander can ensure better equipment sustenance and maintenance. Integral logistics units will also not have to carry all kinds of spares too far ahead in the area of conflict. There is also a need to make our distribution system more responsive to the user's requirement. Efficiency and economy can only be ensured in an automated environment while meeting the requirement. If we can quickly 'bar-code' our material and medical support and put this data on-line where password protection can ensure secrecy, we can have all kinds of advantages. Commanders and logisticians can keep track of material in motion.

Another well established practice increasingly being adopted by all major armed forces is the preferred option of shedding excess logistics baggage to service providers, also known as third party logistics (3PL), especially in non-core areas. This has a twin advantage. Firstly, the armed forces personnel can be more efficiently used for core operational duties, thereby, improving 'teeth-to tail' ratio. Secondly, the armed forces the world over are being put

to greater financial scrutiny and public debate over the budgetary allocations. This is more true in a democracy like ours. Media and public awareness have made the armed forces cost conscious and accountable on the economic front. Our three Services are aware of the need for outsourcing certain non-core areas of logistics management to service providers. However, presently the process is being undertaken by each Service in an individual manner. Also, the pace is yet to gain the desired momentum.

SUGGESTED ROADMAP FOR LOGISTICS TRANSFORMATION/ INTEGRATION

Addressing the need purely at a macro level of logistics management would have to take place at three levels: first, at the national level; second, at the ministerial/inter-Services level; and third, within each individual Service on a functional basis. It would also necessitate a holistic approach to acquisition, operation and maintenance of weapon systems/equipment.

The above analysis clearly indicates an urgent need to have a relook at/ understand the entire strategic planning process. Thereafter, we need to evolve a logistics management system to ensure that the acquisition and maintenance of defence needs are conducted efficiently and effectively in order to achieve the operational objectives of the armed forces in their furtherance/support of national security aims. Perhaps, this introspection could be aided by an understanding of the systems in vogue in the more militarily advanced nations like the USA, UK, etc.

National Level

A National Logistics Council (NCL) should be created, with a wide political, government and industrial representation. Pakistan already has a National Logistics Cell, which is playing a major role in the harnessing and mobilisation of its national resources; a case in point is its role during the Pakistan Occupied Kashmir (PoK) earthquake relief operations. The NLC could either be established as an independent body like the National Security Council (NSC) or made a part of the Planning Commission. The

functional scope of this body could include determination of a broad framework for building infrastructure for both developmental and defence needs, providing broad policy guidelines at a strategic level on areas including transportation infrastructure, industrial effort of war, strategic stockpiling, energy utilisation, satellite utilisation, etc, and act as a coordinating agency between different functional ministries.

MoD/Tri-Services Level

Creation of an organisation on the lines of the DLA/DLO of the US/UK at the ministerial/inter-Services level would enable integration of logistics management to the extent feasible. This organisation could be placed either as an independent body under the MoD or could function under the Chief of Defence Staff (CDS) (when implemented) or the Chiefs of Staff Committee (COSC). It could oversee the performance of the Defence Research and Defence Organisation (DRDO), Director General of Quality Assurance (DGQA), ordnance factories and other defence PSUs and act as a link with the NLC to coordinate defence needs and mobilisation of national resources during war. The existing Defence Acquisition Council/Defence Procurement Manual (DAC/DPB) will be unable to perform this task even if allotted.

Integration at Tri-Services Level

Some functions of the Services, like medical, postal, works, movement control, common user ammunition and main grades of fuel, rations, and so on, have already been integrated on inter-Services basis. Integration achieved thus far has paid dividends in economy and unity of purpose. Notwithstanding the present levels of integration achieved, vast scope still exists in crucial areas such as standardisation. Standardisation of equipment amongst the three Services will lead to major savings and would facilitate the process of integration. Also, codification of common items amongst the Services will improve asset visibility and assist procurement and disposal. Similarily, an integrated transportation system, including air and sea, will result in optimum utilisation of existing tri-Service resources.

Integrated Defence Logistics Staff

With the creation of Headquarters Integrated Defence Staff (HQ IDS), it would be worthwhile and logical to integrate defence logistics under the CDS (presently COSC). This organisation within the CDS/COSC can study areas of integration, work out integrated procedures and put into motion the process of integration of tri-Service logistics.

The armed forces must revolutionise their logistics programme and provide support on time. It must become predictive, anticipatory and responsive.

Service Level

There is a need to integrate all logistics functions within each Service and adopt a holistic view of logistics, right from induction to disposal of a system. This would necessitate an appreciable change in mindsets, as power equations within the organisation would get affected. It would also enable a better appreciation of the feasibility of outsourcing, thereby, availing the opportunities provided by industrial infrastructure and capability. This would enable us to review our maintenance and supply echelons and take a pragmatic view on centralisation vis-à-vis decentralisation.

CONCLUSION

The armed forces' need to transform is like that of many other organisations undergoing change. The Services are facing many of the same challenges. World class companies must transform their support structure if they expect to continue to dominate their business sectors. To sustain their competitive edge, these commercial industries have reengineered their processes, contracted out services and products where such outsourcing provided better performance at a lower cost, incorporated emerging technologies, and overcame institutional resistance when many wanted to maintain the status quo. The armed forces must revolutionise their logistics programme and provide support on time. It must become predictive, anticipatory and responsive.

Our logistics system must be able to anticipate problems before they

occur. Technology can enable accurate predictability. Through state-of-the-art information systems, the forces can monitor consumption of expendable supplies such as fuel, repair parts, ammunition, rations on a daily basis. Fully exploited, these systems can also automatically deliver supplies at the level required, consistent with the resources on a competing priority basis.

Automatic identification technology (AIT) includes bar codes, radio frequency (RF) tags, satellite tracking, "smart cards", and laser cards. COTS satellite tracking provides real-time monitoring of transportation assets and customer products. The visibility of goods and assets in storage, in transit, and in process has resulted in reduced inventory levels and order and ship times and improved overall responsiveness to customers.[25]

The module of military transformation being adopted by the US and other multinational forces deployed in conflict at far off distances from their own geographical locations with almost negligible opposition may not necessarily be followed by our forces; however, certain universally acknowleged best logistics practices followed by the armed forces and in the commercial sector are equally applicable and desirable for us as well and need to be taken up on priority.

The above analysis brings out a noticeable trend for evolutionary change in Indian defence logistics. There is a need for a revolutionary change in the way we support the forces. This revolution is about more than providing equipment and supplies better, cheaper and faster, although these initiatives are crucial for readiness and modernisation today. It is also about rethinking logistics functions and processes that will enable decisive victories well into the future. This revolution spans the depth and breadth of military logistics. It includes integrating logistics functions; replacing volume with velocity, reducing demand and lightening the logistics load on the ultimate customer—the soldier.

25. Larry Smith, "Commercial Logistics Best Practices for the Revolution in Military Logistics," *Army Logistician*, January- February 1999, pp. 137-141.