MODERNISATION OF INDIAN ARMED FORCES IN THE 1990s

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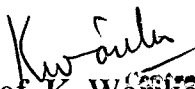### New Delhi - 110 067

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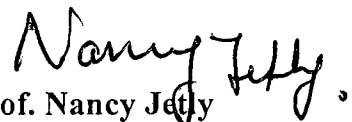and Southwest Pacific Studies
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PREFACE

Technological changes have always triggered military modernisation. In the last decades of 20th century, new scientific developments based information technology began to influence military structures all over the world. The change was not merely in new weapons. It affected military doctrines, modes and conduct of warfare and organisation and management of defence. All these factors, combined, have come to be called Revolution in Military Affairs (RMA).

However, RMA is not used in defence debates as a synonym for what military historians call military revolutions, which are major changes in the way states prepare and wage war. Military revolutions are much less frequent phenomena than RMAs. It is possible to have more than one RMA in a century, whereas military revolutions happen in longer cycles. The current RMA, broadly defined, results from the passage of advanced societies from an industrial base to an information base. The broad definition of RMA points at a greater concern for all critical information infrastructures that make a nation function smoothly. It talks about highly mechanised professional armies and a revolution in defence management, including the relations between the defence establishment and the industrial base.

RMA, therefore, is a mix of technologies, doctrines and organisations that transforms military operations. It is a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational and organisational concepts, fundamentally alters the character and conduct of military operations.

Military forces and operations using the latest RMA will be characterised by dominant battlespace awareness; new weapon platforms, munitions, and sensors or reconnaissance systems that make possible deep and precision strikes; emerging information technologies and capabilities in conjunction with current weapon systems which would increase the potential for Air-Land Manoeuvre.

Information technology (IT) is the single factor, which has caused massive changes to effect an RMA in the present century. IT involves the study and application of data and the processing and development and use of the hardware, software, firmware, and procedures associated with this processing. Information technology differs from the previous military technological revolutions, as the technology is cheaper and can be acquired by states and non-state actors (like terrorists and organised criminal gangs) as it is available in the market place. It is fast changing and mostly commercially produced.

Thus military will have to depend on private industry to benefit from what is known as 'off-the-shelf' technology (COTs)- pertaining to equipment already manufactured and available for delivery from stock- rather than update itself each time the technologies advance.

The possibilities offered by global networks like the Internet have helped states and non-state actors engage in a network centric warfare, which involves effective linking or networking of the warfighting enterprise. It is characterised by the ability of geographically dispersed forces to create a high level of shared battlespace awareness that can be exploited via self-synchronisation and other network-centric operations to achieve commanders' intent. It leads the state militaries to change their hierarchical organisation and exclusive functioning of the three services.

While new Information Technologies have shaped it, RMA, like any other revolution, is a result of current international social, political and security situation. It is mainly a result of, or a response to a variety of factors. One such factor is the changing nature of conflicts, especially the advent of 'asymmetric warfare' where the mighty militaries of the state fight individuals and organisations armed with rather primitive weapons but should not be using heavy artillery to suppress them, for fear of international condemnation. It also involves what is called Low Intensity Conflict or Proxy War.

RMA is also a way of adapting to new technologies. The same microchips churned out by private industry can now be used both in civilian applications and precision-guided munitions. 'Rogue' states as well as those who could not have afforded

heavy artillery and military equipment can now buy these off-the-shelf and use them against adversaries.

Information --or rather the asymmetry of information—has emerged as the key factor in winning wars of the future. Information has always been a major factor in winning conflicts, or in 'lifting the fog of war'. But now, the asymmetry of information is narrowing down, as it is available literally at the click of a computer mouse. Military planners thus have the challenge to be better informed about the enemy's whereabouts, which should be superior to the vast sea of information that is already available. Essentially it means winning the war even before it starts.

The threat of nuclear, biological and chemical weapons of mass destruction has acted as deterrence against all-out wars, as they would lead to massive annihilation. However, conflicts will continue to arise, and they will be faster, low-intensity, guerilla, and by proxy, rather than long wars of attrition.

The need to reduce casualties and increase force-multipliers is one factor which contributed to the re-look at the warfighting enterprise. The standing cost of armies is going up. The national and international reaction to casualties in wars of attrition will put pressure on governments, especially with the growth of international media coverage. These factors, together with adverse trends in military enrollment compel states to bring down the size of their militaries. For this, while the quantity is reduced, the quality needs to be improved using the introduction of force multipliers.

The basic concepts of RMA were successfully experimented in Gulf War (1990) which showed the future shape of wars- maximum impact with minimum casualties. US Army formally adopted RMA as Air Land Battle in the Official doctrine FM-100-5 and called it "Joint Force Doctrine" as envisioned in Joint Vision 2010 published in July 1996 by the Chairman of the Joint Chiefs of Staff which was modified in Joint Vision 2020 in 2001. US armed forces have undergone significant reorganisation and improvements in reconnaissance and surveillance capability for tactical battlefield advantage. Other countries have taken note of RMA and tried to adapt to the emerging conditions in defence management.

NATO and developed countries have updated these continuos technical advances. Pakistan, Japan, South Korea and China too have devoted considerable attention to RMA. ASEAN countries have also made considerable progress. Pakistan depends on acquisitions rather than indigenously develop its RMA. it has a strong technological application in all fields of military capability including integration of services, logistics and ISR. Because of the civil-military technological orientation, even lesser military enthusiasts like Australia and Singapore have shown considerable interest in RMA. Israel and China are quick in adopting RMA. China's PLA has been modernised for fighting in high-tech battlefield conditions. Its main concern is a possibility of a high-tech war over Taiwan.

The present study is an attempt to see where India stands in the RMA debate. There is a strong case made for India's military modernisation and changing defence organisation, command and control. India has been working towards this. India has been moving towards modernisation though acquisition, technology transfer, retrofitting, upgradation, and licensed/joint production. There is also increased interaction with the private industry as a move towards a military industrial complex. The industry has been sounded on the armed force's needs for computer software and telecommunications.

Beginning from the last decade of 20th century, RMA has occupied a major place in India's defence debates- reflected in speeches by generals, defence ministers and articles in defence and security studies journals as well as media reports. While the low intensity conflict in Kargil proved a hastening factor, Indian armed forces have already been undergoing major organisational changes in the last few years. Though India has not been trying to revamp armed forces in tune with what the US does, there is certainly a lot of debate that reflects the influence of RMA in the Indian military and strategic thinking, as well as continued activity in all fields that the current RMA affects.

The present study proposes to trace this debate and see how RMA and its various manifestations have been incorporated into the Indian defence apparatus. It is not to argue that India is toeing the US line, but to see how India's specific threat perceptions make it imperative to have certain changes in organisation and military hardware, which seem to

be coming under the framework of the current RMA. In addition to tracing the debate in India on RMA, it will also see which areas have been affected, what has been done in military hardware as well as software and communications to keep pace with RMA.

The study has been divided into five chapters and a conclusion. The first chapter is introductory and will give a conceptual and historical framework to the discussion that follows in the rest of the dissertation. The second chapter will discuss India's security environment in the 1990s, touching upon both the external and internal dimensions. However, the thrust will be on areas where are real upgrading or role for the military is perceived. The third chapter titled Indian Armed forces and the RMA is the core chapter. Using RMA as a yardstick of sorts, the modernisation drive of Army, Navy and Airforce will be assessed critically, giving the major projects that succeeded and pointing out the pitfalls and shortcomings. India's Intelligence, Reconnaissance, Surveillance and information warfare capabilities will be assessed in the fourth chapter. The fifth chapter will discuss the various financial problems faced by the military. The discussion will trace budgeting trends and see if India's budget trends are in tune with the global trends and whether it is spending for military at the expense of development. The chapter will also trace the increasing participation of private industry in military technology.

The study will ask the following research questions:

- Can a developing nation like India, with security concerns and economic priorities that seek equal attention adopt the new Revolution in Military Affairs, a concept essentially developed and advocated by USA, and already adopted among others by its neighbour China?

- What would a current appraisal of Indian Armed Forces reveal if one were to use the latest RMA as a yardstick?

- What are the organisational and financial challenges that come in the way of the modernisation of Indian armed forces?

- Can India, with security threat consisting of two nuclear-armed adversarial neighbors, internal and cross-border terrorism and a low intensity conflict, afford to ignore modernization of Defence forces in tune with this latest military technical revolution?

The research methodology used is analytical with examination of historical records. Primary sources for conceptual and historical framework were the various defence documents of military powers, especially the Joint Vision 2010 and Joint Vision 2020 of the USA. To locate the Indian RMA debate, the primary sources are the Ministry of Defence Annual Reports, various recommendations of the Kargil Review Committee, Group of Ministers of Security and 'Sainik Samachaar" the official bulletin of the Indian army. The annual reports of Ministry of Information Technology has also been consulted.

Indian Defence journals like Strategic Analysis, Indian Defence Review, Combat Journal have also been consulted as secondary sources. Books on Indian military and information warfare were referred to for inputs. The websites of the Chamber of Indian Industries, Ministry of Information Technology and Ministry of Defence have been consulted for the latest update on the various changes and technological innovations happening in the field of RMA Also, various newspaper reports, news magazine articles on defence have been referred to.

Chapter 1

Introduction

Revolution in Military Affairs: Conceptual and Historical Framework

1.1 Introduction

Military modernisation of nations depends mainly on three factors: prevailing national security situation, technological capabilities of the nation and availability of funds as earmarked in defence budgets. While technological innovations are primarily applied to military, the threat perception increases the perceived need to acquire more equipment and modernise existing arsenal, through indigenous research and development, licensed production or through purchases.

The 1990s saw Indian armed forces going through various crises related to all these three aspects, viz., technology, availability of funds and real and perceived threats to its national security from outside as well as from within. At the global level meanwhile, there were changes so far-reaching that it led to what later became known as Revolution in Military Affairs (RMA), a new paradigm in methods, means, technologies and operational concepts of warfare, based on the application of information technologies.[1]

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[1] The discussion on RMA is based mainly on the following sources: Kapil Kak *Revolution in Military Affairs - An Appraisal* Strategic Analysis, April 2000 Vol. XXIV No. 1, pp. 5-16 ; Akshay Joshi *A Holistic View of the Revolution in Military Affairs* New Delhi: Strategic Analysis February 1999 Vol XXII No. 11, pp.1743-1759 ; Ajay Singh *The Revolution in Military Affairs: 4-Dimensional Warfare* Strategic Analysis May 1998, Vol. XXII No.2, pp-169-179, Nicholas Berry *The Revolution in Military Affairs (RMA) Is Not Only about High-Tech Weapons* 'Asia Forum', Centre for Defence Information: Massachusetts Avenue, N.W. Washington D.C. August 16, 2000 available online at www.cdi/asia/fa081600.html; Dan Goure *Coping with Chaos: The changing Face of Modern Warfare* Jane's Defence Weekly Vol. 35, No. 3, January 17, 2001 pp. 22-26; Ahmed S. Hasim. *The Revolution in Military Affairs Outside the West* Journal of International Affairs, vol 51, no 2 (Winter 1998) New York: Columbia University at www.comw.org/rma/fulltext/hasim.html

The present study is an attempt to place India in the global debate on Revolution in Military Affairs in the 1990s, a decade in which it was introduced and put to test, and for or India, a period of intense strife in all three counts of threats to national security, technological capability and budgets.

Modernisation is seen as a function of power, which is on the agenda of the third world states, as it is closely linked with national security. Modernisation implies three things: domestic cohesion around national as against primordial consciousness, autonomy of the individual and his participation in the socio-economic process and the growth and size of the technological capability.[2] In third world countries like India, the technological progress is often inter-linked with the prevailing international technology regimes as much as it does with domestic capabilities at developing technologies. The present study attempts to trace the growth of Indian armed forces' modernisation process in the nineties. In this chapter, the main concepts of RMA will be introduced, to bring a conceptual and historical framework for the following sections.

In the last decade of the 20th century, new scientific developments based on Information Technology (IT) began to influence military structures the world over. It must be remembered that IT-oriented RMA changed not just the strictly technological aspects of warfare, but, applied to nearly every aspect of defence: military doctrines, operational concepts, force levels, weapons and modes of warfare.

American National Standard for Telecommunications defines Information Technology in its Telecom Glossary 2000 as: The brand of technology devoted to (a) study and application of data and processing thereof, the automatic acquisition, storage, manipulation (including transformation), management, movement, control, display,

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[2] Rakesh Gupta *'India's National Security: Some Aspects'* in M Rasgotra et al (eds) *India's Foreign Policy in the 1990s*, New Delhi: Patriot, p 83

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switching, interchange, transmission of reception of data and (b) development and use of hardware, software, firmware and procedures associated with this processing.

The best known definition of RMA is the one provided by Dr Andrew Marshall, Director of the Office of Net Assessment, US Department of Defence, who described it as a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and erations and organisational concepts, fundamentally alters the character and conduct of military operations.[3]

It must be remembered that technology alone cannot bring about true revolution in military. Andrew Marshall's definition obviously links technology to the doctrine, operational and organisational concepts. If it was like a mere introduction of a new weapon, like, say the AK-47, such an overhauling of military affairs would not be warranted. What leads to a re-look at operational and organisational concepts is a massive change in technology, which is partly a result of social changes, and partly a cause of such changes. In other words, the computers have been a result of ongoing research carried out during the Industrial age, especially in the late 19th and early 20th centuries. But when they were introduced in large-scale, information technology has led to what later came to be called information society or knowledge society. As we will see later, it has changed the structure in which economies are shaped, altering patterns of production and wealth.

In other words, while Information Technology is its key motivation, RMA is not just the use of computers or electronics in the theatre of warfare, but something that affected militaries and security debates on a deeper level. It is different from military revolutions, which means the major changes in the way states waged war: like the

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[3] A W. Marshall, director of net assessment, Office of the Secretary of Defense, Washington, D.C., memorandum for record, subject: *Some Thoughts on Military Revolutions*-Second Version, 23 August 1993.

changeover from bows and arrows to use of guns and cannons, and then of air power and so on. Military revolutions in the strict sense of the term, are much less frequent phenomena than RMAs. It is possible to have more than one RMA in a century, whereas military revolutions happen in longer cycles.[4]

1.2 RMA as a result and cause of changes

Revolution heralds change. RMA is a result of changes in the way we live, and it creates changes in the way conflicts will be fought. What has changed in terms of society, economy and military to bring about a change in the way nations look at warfare?

- Socio-economic changes of the last decade of 20th century: best-escribed by the visionary Alvein Toffler and Heidi Toffler as 'Information Revolution'.

- Politically, the world has become a global village characterised by integration and international as well as regional organisations. In a way it led to some countries or group of countries legitimising their intervention in conflicts of other nations (Gulf War, 1990) or even in the conflicts within nations (Kosovo, 1999) often at the peril of the concepts of state sovereignty and territorial integrity

- Militarily, the proliferation of weapons of mass destruction (WMD) has brought about fear of mutually assured destruction (MAD), which in turn led to low intensity conflicts and clinically precise strikes by enemies, often from the air.

- While conflict was unavoidable, the MAD factor lead to low intensity conflicts (LIC), guerrilla warfare, asymmetric warfare, state versus non-state actors conflicts and proxy war.

- The expansion of global media and communication facilities meant that events are transmitted across continents in real time (meaning as they happen), evoking immediate reactions from all part of the world on any type of conflict.

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[4] Thierry Gongora *The Revolution in Military Affairs: What should the CF do about it?* National Network News, The Defence Associations National Network: Vancouver, Volume 5 No. 2 - Summer, 1998 (presentation made at 'Security and Defence Forum Conference, Ottawa 29-30, April 1998 at www.sfu.ca/~dann/backissues/nn5-22.htm)

- If faced with the prospect of a war with another nation or group of nations, powerful nations will have to find consensus, and the less powerful ones will have to wait till the consensus is reached or abandon the idea of invading another nation's territory or engaging in a full-scale war.

- The availability of lethal weapons and the transmission of images of war across the world meant that any country violating international norms of behaviour will be immediately condemned, and if it goes to war, stifled both economically and militarily (Iraq's invasion of Kuwait in 1990 is a case in point)

- The increasing number of casualties would lead to massive protests at home either against war or for quick end-results, which again leads countries to plan well in advance and end wars with minimum casualties to the home side. Therefore wars have to be short, with minimum casualties to the homeside, often pursued by news cameras showing on how it is being fought and won. (Kargil war of 1999 is an example in the South Asian context)

- Moreover, the concept of war as one state invading the territory of other has almost died down, as the states are faced with new threats, often from non-state actors, like separatists, insurgents, secessionists, organised criminals and terrorists. These are but some major aspects. But each has to be discussed in detail.

1.2.1 Societal changes: From Agrarian Age to Information Age

The present RMA, broadly defined, results from the passage of advanced societies from an industrial base to an information base. Alvin and Heidi Toffler had in their path-breaking book 'Future Shock?' explained history in terms of three waves: the agricultural revolution, (first wave), Industrial revolution (second Wave) and Electronic Revolution (third wave).[5]

The first wave occurred between 800 BC to around AD 1650-1750, after the widespread adoption of agriculture, leading to permanent human settlements in villages around fertile fields. Possession of land, rural labour and domesticated animals was

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[5] G D Bakshi,, *War in the 21st Century* New Delhi: Lancer 1997, pp 3-34

indicative of wealth. This also brought about the fist human conflicts. Rudimentary nation states and empires emerged, with standing armies. Arms varied from two to four-infantry, cavalry, chariots and elephants. Wars were basically for territorial expansion with the aim of securing rich agricultural land, or obtaining tribute/allegiance of neighbouring states. Second Wave of human civilisation began with the Industrial Revolution of Europe between AD 1650 and 1750. Wealth now shifted from human and animal muscle power to mechanical power. It brought about huge sociological and civilisational changes within industrial societies; in geopolitics, inter-state relations and the nature or war and its methods. Industrialised society was the basis of the nation state-which in turn became the focal point of inter—state wars in Europe and later in the rest of the world. This was largely a result of industrialised nations' quest for colonies and captive markets for their mass-produced goods.

In Toffler's view, this led to the first 'clash of waves'- between ancient first wave (agrarian) civilisations of Asia and Africa and colonising thrust of the second wave (industrialised) western states. It was fought at inter-state levels between the west and the east as well as in intrastate level between agricultural and industrial sectors of the same societies.

Industrial Age changed the shape of wars. Muskets gave way to bolt action rifles and machine guns and ammunitions rounds, produced by the millions. Artillery reached a peak of sophistication and lethality. From First World War onwards, armies relied upon rail networks for strategic mobility. Wheeled vehicles enabled armies to move on roads and tracks, leading finally to tanks, which could move cross-country. Along this came aircraft and air power. WW II saw the machine age paradigm of war of the Second Wave pushed to its ultimate limits.

What Toffler calls the 'Third Wave' refers to the Electronic Revolution, alternatively known as the Information Revolution. Computing and calculating machines were invented in the industrial age itself. While Industrial Revolution had a life span of 250-300 years, electronic revolution is just over 50 yeas old now. But in terms of wealth,

what the industrial revolution did to amplify power of human muscles, the electronic revolution did to amplify the power and capacity of human neurones. This wave witnessed and explosion of information. While Industrial Revolution gave mankind the telegraph, rail, road, ship and aeroplane, Electronic Revolution led to inventions of radio and television, and later, computers. The prize resource of Third Wave became computer software and the technology of information. Computers spread to banking and financial transactions. Time also became an allied resource.

1.2.1.1 The clash of waves:

Just as the clash of the first and second wave witnessed inter and intra-state wars between agricultural and industrial sectors of civilisation, Toffler predicts a series of wars between economies that have stepped into the electronic age and those that are still stuck in industrial, or even agrarian era. Perhaps the best example of such a conflict is the Gulf War between Iraq and Coalition States, and more recently, the America-led war on terror waged in Afghanistan.

Nothing else has highlighted the impact of the Information Revolution upon warfare as much as Gulf War did. Iraq, with the fifth largest army in the world, liberal Russian military assistance and much-mechanised first-rate tanks and artillery, was routed, because its army essentially belonged to the Industrial Age. Its concept of static defence lines and pure attrition methods, last used in the two World Wars, failed. The American-led Coalition forces wrested complete control of the electronic spectrum. Through propaganda by the live coverage in Cable News Network (CNN), they launched a massive psychological operation that completely isolated Iraq's leader Saddam Hussein. All his electronic sensors were destroyed, his communication nodes jammed. America's spy satellites and remotely piloted vehicles (RPVs) helped its commanders look deep inside Iraq and generate total transparency. Then the electronic software and hardware was used to launch deep attacks using Tomahawk cruise missiles with terrain-matching computes for pinpoint guidance, stealth (F-177) radar-invisible aircraft with smart munitions and attack helicopters with laser-guided bombs. After wresting complete

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control of the electronic spectrum, Americans, over a month, mounted a relentless air campaign to defeat Iraq.

The unprecedented flow of information in the Third Wave societies has been greatly helped by the phenomenal growth of Internet, which began essentially as a military innovation, but grew beyond the control of military into the world's largest networked system.[6]

Discussions in the RAND Corporation in the early years of Cold War were premised on the threat of a possible nuclear war with USSR. A major concern was how a post-nuclear America would preserve its command-and-control network, linked from city to city, state-to-state, and base-to-base. In case of an atomic attack, any central authority would be an obvious and immediate target for an enemy missile. The centre of the network would be the very first place to go.

Against this possibility, a networked structure was introduced by RAND staffer Paul Baran, which was made public in 1964. Baran's idea of network would have no central authority and will be designed to operate while in tatters. All the nodes in the network would be equal in status to all other nodes, each node with its own authority to originate, pass, and receive messages.

Shortly afterwards, the Pentagon's Advanced Research Projects Agency (ARPA) decided to fund a larger, more ambitious project in the USA. This pioneer of Internet revolution, ARPANET formally expired in 1989. But Internet was soon 'demilitarised' and became one of the greatest civilian technologies.

There is no system that reflects the democratisation of information the way the Internet does. The use of computers for international computation further enhanced and expanded how humans connect, communicate and create communities. It has realigned

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[6] Bruce Sterling *Short History of the Internet* Cornwall, CT: The Magazine of Fantasy and Science Fiction, February 1993 at www.library.yale.edu/div/instruct/internet/history.htm

social and economic dynamics. All commercial organisations are forced to enter this truly global market place. [7]

1.2.1.2 Information Age and changing concept of power:

In the Information Age, concepts of distance and position lose their relevance since immaterial goods transmission can be carried out at no or low cost and regardless of the distance. State power depends on the capability to innovate, rather than just managing and controlling available resources. Due to the possibility of long-distance communication, traditional institutions lose knowledge monopoly and control of its spreading. Information Revolution transforms organising models in society and production, from vertically hierarchical structures to horizontal structures, all directly reachable to all potential political and economical protagonists. Traditional institutions, keeping a vertical and hierarchical structure thus find it hard to resist these new organisations. Hence the difficulties caused to states by global terrorism, trans-national crime, and relevance of NGOS and lobby groups.

Therefore, in information societies, governments must face directly a public opinion that is constantly informed about events as they occur. Political actors must chase events, being always bound by preservation of consensus, and this produces a practical impossibility of long-term planning and of preventive action. [8]

Information Revolution could, however, be useful for governments as a political instrument and force multiplier, putting together the traditional hard power (often characterised by military muscle) with what is known as 'soft power.' Soft power means the capacity to obtain prefixed political goals through consensus, through the use of information aimed at persuading the other party to act in accordance with one's interests.

7. R J Garigue, *Information Warfare: Developing a Conceptual Framework,* Washington D C: Decision Analysis Laboraroty, Carleton University, Draft Version 2.1, 2000, pp 4-14

8 Carlo Finizio *Challenges of the Information Revolution,* Paper Presented at second Asian Security Conference, Towards a New Asia at Institute of Defence Studies and Analysis, New Delhi, Jan 2001, p 2

In the case of traditional hard power, focus is on information dominance: to discover the counterpart actions and strike it. In the case of soft power, the final goal is to obtain the ideological dominance, that is the capability of persuading the counterpart due to the superiority of economical, cultural and organisational model. Obviously, the soft power can also be used in a defensive way to protect the national model from an aggressive foreign model.[9]

Winning groups (of nations) would thus be those who organise themselves in a non-hierarchical structure adherent to information flows, accept and foster technological, cultural and societal innovation, turn their function towards the development of international competitiveness of economic systems, act in hidden forms, covert actions and use the soft power both as defence and offence.

In the Post-Cold War security scenario of the 1990s, it was soon realised that Information Revolution empowers non-state actors as much as it does states.[10] Like the computers, which often function in interconnected network systems without hierarchies, the world has witnessed terrorists and organised criminal gangs effectively developing such networks in the last decade.

Information empowers the non-state actors, a key threat to security, with non-hierarchical command structure, while state actors continue to follow hierarchical command systems. In this context, the method for waging war should be to enter the enemy's decision making cycle and gain insights in to his strategy, powered by new information technologies. In involves defensive methods of denying enemy access to our systems, and offensive methods of getting into the enemy systems to disrupt their smooth flow of information.

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9. Ibid p 4

10. Frank J. Cilluffo *The Role of Intelligence in Indentifying, Preventing and Responding to Transnational Terrorism*, Remarks to the American Bar Association Standing Committee on Law & National Security December 10, 1996 , From Transnational Threats Resource Center, Global Organized Crime Project, Central for Strategic and International Studies : Washington, DC at www.csis.org/goc/a0961210.html

While information can be described as "what is happening," knowledge is "what it means" to a single observer with specific interests and needs. Creation of such context forms the focal point of knowledge management, as it looks at the relevance or pertinence of one set of information with regard to another. In a computing environment, knowledge management would involve the creation, transformation, storage, usage and replacement of highly complex models and computation structures, which create meaning in a formalised way. [11]

1.2.1.3 Information as a security vulnerability

Access to strategic and demographic information has always been a factor in how operations in warfare as also the end results were determined. But the same capacity is being used by individuals and organisations to challenge governments. America's National Computer Security Association has predicted that Information Warfare will be waged against the most vulnerable elements and infrastructure components. For information-intensive nations, this becomes vulnerability from planned computer sabotage and also global disinformation. Subversion of networks could cripple the economy, wipe out bank savings, shut down phone systems, erode trust in democratic institutions and disrupt essential services and organisations.

Through data manipulation, theft, system sabotage and other means, entire economies and institutions may be rendered unworkable. Such attacks in fact blur the distinction between civilian and military Information Warfare activities, mandates and responsibilities.

1.2.2 Changing global security scenario:

The changing face of modern warfare involves numerous low intensity conflicts, where states confront non-state actors supported by other states or acting alone; the pressures of the media and the need to show to the public (often through media) that

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11. R J Garigue, n 7, p 9-10

something is being done; the asymmetric nature of threats, where even nuclear powers fail to deal with suicide bombers; and the general global opinion against war and abhorrence of huge war casualties.[12] The present RMA is not just a revamping or overhaul of militaries but a response to these changes in nature of conflicts.

One such feature is the asymmetric warfare. In asymmetric threats, state militaries find themselves fighting individuals and organisations armed with rather unsophisticated, even primitive (as in the slingshots of Palestinian intifada versus the mighty Israeli army) weapons. The pressure of global opinion- brought about by its real-time dissemination through cable and satellite television networks- will be on the military to avoid usage of heavy artillery, for fear of international condemnation.

It should be noted that the same microchips churned out by private industry could be used both in civilian applications and precision-guided munitions. This helps rogue states as well as non-state actors who thus far could not have afforded large-scale, costly military equipment to now acquire these technologies off-the-shelf, relatively cheaper. Information or rather the asymmetry of information has emerged as the key factors in winning wars of the future. The problem is not the availability of information, but the narrowing down in the asymmetry of information, as it is available for everyone literally at the click of a computer mouse. From the vast sea of knowledge, military planners have the task of sifting information that can be put to use as intelligence in the decision-action cycle of the war-fighting enterprise. Thus, Military planners face the challenge to be better informed of the enemy's whereabouts, which should be superior to the vast sea of information already available. The threat of nuclear, biological and chemical weapons of mass destruction has also pre-empted an all-out, long drawn war of attrition, as it could lead to massive annihilation.

Future will see low intensity conflicts, guerrilla warfare, proxy war and asymmetric warfare. As the new technologies become cheaper and accessible to all, those

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[12] Dan Goure , n 1, pp. 22-26

who could not afford heavy artillery can now buy other technologies and use them against adversaries. With the standing cost of armies is going up, an urgent need was felt in world's armed forces to reduce casualties and increase force-multipliers. Adverse trends in military enrolment compel states to bring down the size of their militaries. While quantity is reduced, quality needs to be improved, using the best available technology.

Perhaps the greatest change in security scenario that led to an RMA is not the technological revolution in platforms, munitions, guidance, surveillance and command and control, but in the nature of war itself.[13] Most countries are realising that threat of foreign invasion has virtually vanished. Invading a neighbour is contrary to current global norms and is illegitimate. Iraq found it the hard way. Globalisation may have largely erased borders for investments, trade, information and other exchanges, but it reinforced them against military aggression. National territory is sacrosanct, says Berry.

Threat of counter attack by a coalition of major states leads potential invaders to think twice. Wars are no longer internal, often leading to justified international intervention, including combat. Example include East Timor, Sierra Leone, Kosovo and Bosnia.

International crime and terrorism, piracy on the high seas, drug trade and people smuggling threaten the jurisdiction of all governments over their people and territory. In such scenarios, combating them becomes a military function in co-ordination with civilian authorities. These factors will increase the importance of navies, marines and airforces, faster and lighter vehicles and military units.

With the fall in defence spending after the end of Cold War, the armies were required to fulfil tasks with decreased resources and manpower, which increased the need for force multipliers, often provided by innovations in information technology, primarily meant for civilian applications. This is an interesting aspect, because earlier, it was often

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13. Nicholas Berry, n 1

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the military technologies that were later put to civilian use. Now the cycle is being reversed.[14]

1.2.3 Changing concepts/methodologies of warfare:

Since IT-oriented RMA is not just about technology, military thinkers have started coining new modes of warfare, that requires new operational concepts and application of various integrated technologies. Much of it continues to be in theoretical stage, and have often overlapping descriptions and definitions.

One of the many definitions of Information warfare is "actions taken to preserve the integrity of one's own information systems from exploitation, corruption, or destruction while at the same time exploiting, corrupting, or destroying an adversary's information systems and in the process achieving an information advantage in the application of force.

It is also the actions taken to achieve information superiority in support of national military strategy by affecting adversary information and information systems while leveraging and defending our information systems. Command and control warfare is a subset of information warfare.[15] Another definition is: "the offensive and defensive use of information and information systems to deny, exploit, corrupt, or destroy, an adversary's information, information-based processes, information systems, and computer-based networks while protecting one's own. Such actions are designed to achieve advantages over military or business adversaries.".[16]

US Air Force's standard definition of Information warfare is: "Any action to deny, exploit, corrupt, or destroy the enemy's information and it's functions; protecting ourselves against those actions; exploiting our own military information functions.

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14. Kapil Kak n 1 p 5-7

15. *"Definitions for the Discipline of Information Warfare and Strategy,"* Dictionary of Information Warfare and Strategy, School of Information Warfare and Strategy, National Defense University, Washington DC, p. 37.

16. This widely used definition is by Dr. Ivan Goldberg, Director of the Institute for the Advanced Study of Information Warfare, National Defence University, Washington.

Warfare based on the present RMA, thus would try to achieve information superiority by affecting the adversary's information environment, while defending one's own.

Network-centric warfare and System-of-systems approach are two other concepts being discussed by military thinkers. The possibilities offered by global networks like the Internet which was taken out of US military control, satellite communication facilities, video-conferencing, global-roving cell-phones etc have helped network-centric warfare. Briefly, it means an approach to warfare that benefits from linking or networking of the war-fighting enterprise. NCW leads to state militaries to change their hierarchical organisation and exclusive functioning of the three services-army, navy and airforce- and evolve more loosely-held command-action set-ups which would not look towards a single commander as also jointness in doctrine and action. The NCW is characterised by the ability of geographically dispersed forces, consisting of entities or cells to create high level of shared battle-space awareness. This knowledge can be exploited through self-synchronisation and other network-centric operations to achieve commander's intent.

The system-of-systems approach is another concept developed mainly by Admiral William Owens, former Vice Chairman of the Joint Chief of Staff of USA. It is heavily dependent on the high-tech weapon and surveillance systems of the battlefield and focuses on integrating the three sets of technologies that relate to precision strikes, communications and sensors on the battlefields. It aims at networking of existing and emerging technologies that look, shoot and communicate. Through this, USA hoped to achieve dominant battlefield knowledge over any 200 mile by 200-mile area of the earth's surface.[17] Set against big platforms that concentrate massed armors, this approach is based on the argument that new generations of the precision weapons fuelled by information revolution have made any massed armoured platforms extremely vulnerable.

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[17] Akshay Joshi *A Holistic View of the Revolution in Military Affairs* New Delhi: Strategic Analysis February 1999 Vol XXII No. 11, pp.1743-1759

Apart from network-centric warfare and system-of systems approaches, there are seven other forms of information war identified by military visionaries, which involves protection, manipulation, degradation and denial of information, and can be conducted against the military and civil society. Against the military they include Command and control Warfare, often called C2W, Intelligence based warfare (IBW), Electronic Warfare (EW) and against society, there are info-economic warfare and cyber war.

Psychological operations (Psyops) and Computer hacking can be waged in both military and social realms. [18]

Command and control warfare or C2W focuses on overpowering enemy military command and control information systems assets. American National Standard for Telecommunications - Telecom Glossary 2000 defines it as the integrated use of operations security , military deception, psychological operations, electronic warfare (EW), and physical destruction, mutually supported by intelligence, to deny information to, influence, degrade, or destroy adversary command and control capabilities, while protecting friendly command and control against such actions. [19] C2W is both offensive and defensive. Command and control functions are performed through an arrangement of personnel, equipment, communications facilities, and procedures employed by a commander in planning, directing, co-ordinating, and controlling forces and operations accomplishing the mission. [20] C2W involves a nation's ability to generate commands and communicate with the military services and deployed forces. Such attacks are generally done the old fashioned way, with some sort of deadly, explosive metal objects moving at high velocities.

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[18] Ibid

[19] *Telecom Glossary 2000*, American National Standard for Telecommunications: Washington at www.atis.org/tg2k

[20] '*Information Warfare*" US Department of Defence Directive TS- 3600.1, 21 December 1992: Washington

Intelligence-Based Warfare (IBW) generally occurs when gathered intelligence is fed directly back into the operations being conducted. Intelligence based warfare is a contrast to command and control warfare in that the information gathered for C2W is generally used as input for the overall planning of the operation. An example of Intelligence-Based Warfare is found in warhead sensors. These sensors continuously gather information about a specified target and use that information to decide how to manoeuvre itself in flight. This information flows directly from the sensor to the warhead flight control system. It involves integration of sensors, emitters, and processors into reconnaissance, surveillance, target acquisition, and battlefield damage assessment systems. Examples include the use of satellites and/or Unmanned Arial Vehicles (UAV's) to discern detailed information about enemy military assets, and act upon that information rapidly. Again, nations with the most high-tech militaries usually have the most "force multipliers" associated with IBW.[21]

Electronic Warfare (EW) from a military point of view is defined as any military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy. It consists of techniques that enhance, degrade, or intercept flows of electrons or information. EW could include hard military attacks, physical sabotage, or EMP-emitting devices, directed against military and/or civilian infrastructures. An EMP (electromagnetic pulse) is a surge of electromagnetic radiation which is (in most cases) harmless to living tissue, but which has the capability to render almost all solid-state electronics (i.e. computers, electronic car ignitions, and virtually every other sophisticated modern electronic device) inoperative. EMP effects may have the potential to wipe out an entire nation's information and electronics infrastructure, causing almost incalculable economic and social disruption, and possibly eliminating a nation's capacity for military retaliation.

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[21] The discussion on types of Information Warfare draws mainly from the following sources: National Communications System Technology & Standards Division 1996, *Glossary of Telecommunication Terms*. Washington: General Services Administration Information Technology Service; Ajay Singh: *Information Warfare: Reshaping Traditional Perceptions* New Delhi: Strategic Analysis Vol XXI No 12 March 1998 pp 1793-1803

Psychological Warfare, often termed psyops or psywar is the use of information, real or false, to affect the thinking of the enemy. It includes campaigns designed to affect the perception, intentions, and orientations of decision-makers, commanders, and soldiers. Propaganda campaigns through a massive manipulation of various news media against citizens of a nation may also be classified as psychological warfare.

Though psychological operations are important since ancient times, it can take on new dimensions in the digital age. For example, it will soon be possible to cheaply and quickly fabricate audio and video footage of almost any nature, with such high resolution and attention to detail that it is indistinguishable from genuine footage.

Hacker Warfare (HW) refers to attacking an adversaries computer system or network. Hacker attacks can range from gaining illegal access of systems to denial of service attacks to planting a 'worm' in a network. This is by far the most extensive, interesting, and widely used type of Information Warfare. The Internet is full of hackerwarriors or hactivists, who use their techniques to destroy, degrade, exploit, or compromise information systems. Hactivists are those who do it for the sake of some ideology or standpoint. They include activists of NGOs to terrorists. [22]

Economic Information Warfare (EIW) is expressed in two forms: as an information blockade (which presumes that information flows are as important as supply flows) or as information imperialism (which works on the belief that trade is war). EIW is the act of channelling or blocking information to increase a group's economic status. The main idea is to use information to ensure an economic dominance over an enemy. This type occurs daily between rival companies and also finds itself on the global stage during trade negotiations and other economic matters.

Cyber Warfare (CW) only differs by a degree from Information Warfare as a whole. It is a more fictitious form of IW. Generally, when one talks of Cyber Warfare it is a discussion of the future possibilities of Information Warfare. Ideas such as Information Terrorism and Simulated Warfare are generally the topic. With the current

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[22] Sudha Nagaraj *"Hacking: Dangerous Liaison"* Computers Today, April 16-30, 1999.

technology and information infrastructure these attacks are not yet entirely possible. Cyberwar refers to the use of information systems against the virtual personas of individuals or groups. Cyberwar is distinguished from the other categories in that it is most dependent on technologies and assumptions, which have not yet been developed or tested. Such technologies include (but are not limited to) intelligent "agent" systems and direct neural-computer interfaces. Most of the more lucid experts in the field agree that this "far out" category is of the least significance to international security in the near future. [23]

1.2.4 Changes in Military Technology and innovation:

It is wrong to assume that conventional warfare will be rendered irrelevant by the introduction of an RMA. But the various conventional platforms of warfare will be influenced by the high-precision, high-lethality information technologies. It will reflect in sensors, communication devices, avionics and munitions. In fact RMAs do not always involve strictly military innovations, but those which also have civilian applications, as in steam turbines, railways and the microchip. The present RMA, is the one in which information is the resource, target, and weapon of warfare. [24] The IT-oriented RMA differs from the previous military technological revolutions in some significant ways. It is much cheaper, can be acquired easily by state and non-state actors like terrorist networks and organized criminals, it is available in the common market as civilian technology and can be used as part of military components, making it a dual-use technology.

1.2.5 The defence-Private Industry Interface:

Militaries across the wold have learned the importance to benefit from what is known as commercial- off-the-shelf technologies (COTS). It means equipment already manufactured and made available for delivery from stocks. It is much cost-effective

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[23] Kapil Kak n 1

[24] Akshay Joshi n 18

unlike the usual path of updating of equipment each time technology advances. The conflicts of the future are expected to be swifter, wherein military planners get information about the enemy, enter his decision-action cycle and conduct pre-emptive strikes using precision-guided smart weapons.

There is no other technical area where cost of the required basic building block (microchips and processors) is decreasing while performance is dramatically increasing. This in turn gives RMA a strong business component. There is no other technical area where cost of the required basic building block (microchips and processors) is decreasing while performance is dramatically increasing. This in turn gives RMA a strong business component.

With increased digitisation of military hardware, civilian information technologies began to have military use. Integrated battlefield response systems like Theatre Missile Defence System and National Missile Defence system have given American industry a strong military component, giving a defence orientation to industry. Advances in the military field are being driven by innovations in civilian and commercial areas like long-range communication, operation in harsh and hostile environments, global positioning, satellite imagery and visualisation, network security, data and information fusion and decision support tools. This would require huge research and development, and private participation.
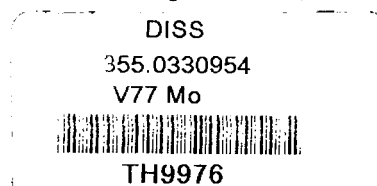
This should be seen in the background of raw resources becoming less of a limiting factor on production of goods and services .As military acquires more commercial software and hardware products, the civilian information infrastructure will be amalgamated with that of government and military. This would in fact expose military information systems to vulnerability. They are structurally weak, because they are built using products that meet commercial needs first and not for military's mission-critical operations requirements. Also, whole systems can become outdated or out-performed by the creation of new components in the market.

With the availability of Commercial-off-the-shelf (COTS) technologies, US military is relying heavily on the research facilities of civilian producers instead of their own R

and D efforts. The reduced defence spending has resulted in Pentagon reducing its own production of sophisticated electronics. The commercial sector has taken the lead in developing IT to exploit opportunities for economic efficiency and profit. Militaries will have to live with less defence spending, and draw on commercial market place to generate key technologies. Thus a large amount of military R and D will be done from the private sector than government labs. Even in weapon systems production, more private commercial enterprises are being involved. US Military will thus become a purchaser of systems than a developer.

1.3 Historical Evolution of the present RMA:

The present RMA stems from the concept of military technological revolution (MTF) developed in 1980s by Soviet Marshal General Nikolai V Ogarkov. MTR aimed at long-range precision strike capabilities by creating combined intelligence, surveillance and reconnaissance (ISR) systems, with the ultimate aim of a war without soldiers. Soon America took note of MTR and pentagon began to develop the Revolution in Military Affairs in the mid-80s. It involved doctrinal and organiational changes as well as use of new weapons. The concept of maximum impact with minimum casualties was tries out for the first time by US and its allies in the Gulf War. In it, high tech, high-cost weapons were used, which were less in number and more effective. [25] Thus the basic concepts or RMA were successfully experimented by the US in 1991. By further analysis of the Gulf War, new concepts and doctrines were developed in the latter part of the 1990s. US army formally adopted RMA as the Air-Land Battle (meaning joint operations of army and airforce) in the official doctrine Field Manual (FM) 100-5 and called it Joint Force Doctrine.. The principles of FM 100-5 were envisioned n Joint Vision 2010, published in 1996 July by the Chairman of the Joint Chiefs of Staff, which was, modified in Joint Vision 2020, published in 2000.There were five main concepts introduced in JV 2010: dominant maneuver, precision engagement, full dimensional protection, focussed logistics and information superiority.

[25] Chandra B Khanduri *"Revolution in Military Affairs: Indi_____dian Defence Review Jan-Mar 2001 pp 63-67

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The declared mission was achieving dominant battlefield knowledge over the enemy, to clear what the German general Carl Von Clausewitz called in 'On War' 'the fog of war' and what Duke of Wellington described as 'the Other Side of the Hill".[26]

Information technology, aerospace technology and warfare materials as key factors. USA tried out a combination of these in the research and development of Strategic Defence Initiative, Theatre Missile Defence and National Missile Defence systems.

1.3.1 Response to RMA by the rest of the world:

The possible responses to overarching changes in military strategy by one nation or a group of nations could be in different ways: deploy a different set of weapons/technologies or develop new ways of fighting in order to offset or bypass the new capabilities of the breakthrough state.[27] Already, armies are decreasing in size as a result of the current RMA; with many emphasising a move away from conscription to a full-fledged professional and highly technical service. The nations of the West, namely the United States and its Western European allies within the current NATO, remain the most powerful military powers in the world. America's substantial security margin is reinforced by the strength of its allies. These states plus other long-time American allies account for more than 70 percent of world military spending. Thus, a general diffusion of military power has slowed dramatically and has come substantially under the control of the United States and its allies, thus widening its military gap with most of the Asian and African nations. Thus, for a long time to come, U.S. armed forces are deemed to be the only ones capable of fully exploiting the technologies and making the necessary organisational and doctrinal changes to benefit from the current RMA. European countries of the NATO alliance do not have the budgetary capability or research and development incentive to fully emulate the U.S. RMA. This gap can result in unease on

[26] Joint Force Doctrine in *Joint Vision 2010: America's Military Shaping the Future,* Washington

D C: Joint Chiefs of Staff Committee, January 1996 at www.dtic.mil/jv2010/jv2010.pdf

27 Ahmed S. Hasim n 1

both sides of the Atlantic and serious operational difficulties between U.S. forces and other NATO forces that are participating in exercises, operations other than war or combat operations. [28]

Hasim quotes a study by the German Army, the Bundeswehr, which, while highlighting importance of information-driven technologies in the current RMA, also warned about the growing gap in this area between the United States and its allies.[29]

People's Liberation Army is advocating a string of measures to develop RMA capabilities. Policy pronouncements of the Chinese military in the last two decades- military modernisation as part of Deng Xiaoping's four modernisations of 1978, and the national defence strategy outlined by the Central Military Commission in 1985- have laid the foundation for an RMA in China. PLA was asked to focus on local, conventional wars and any sudden crises around the Chinese periphery. This re-orientation was based on the view that Mao Zealong's idea of people's war was outdated in an environment that called for rapid responses with high lethality. [30]

PLA continues to give strong concentration on force ratios as the index of relative military power, and emphasis on building massive weapons platforms geared to establish dominance through sheer volume of fire. But there is strong realization that high-tech warfare has developed from an emphasis on guided missiles to one on information and that firepower superiority relies on information superiority. Chinese are hard at work in developing these capabilities.[31]

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28. Such views were expressed by Gerrard Quille in *The Revolution in Military Affairs and the UK*, International Security Information Service Briefing No. 73, December 1998 GlobalBeat: Center for War, Peace and the News Media, New York: New York University Press at www.nyu.edu/globalbeat/usdefence/Quille1298.html

[29] Ahmed Hasim n 1

30 Bappaditya Mukherjee *"China and the RMA"* in Kanti Bajpai and Amitabh Mattoo (eds) *The Peacock and the Dragon : India-China Relations in the 21st Century* New Delhi: Har Anand , 2000 p 109

[31] M V Rappai *"China's Military Modernisation: Some Perspectives"* New Delhi: Strategic Analysis Vol XXI No 10 January 1998 pp 1419-1428

However, the movement it makes towards adopting RMA is significant. There is attention on developing combined arms, rapid deployment units (kuaisu fanying budui), and force mobility, long-range force projection and developing airlift and sea lift capabilities. Both the PLA Navy (PLAN) and Air Force (PLAAF) are undergoing modernisation programmes with this aim. But to a large extent, China will continue to acquire foreign technology to achieve modernisation objectives.

But China is yet to manage co-ordination between military and civilian R and D efforts. China does copy the western technological know-how. Chinese expenditure on current RMA-type weapon systems is largely concentrating on electronic components. One or two of PLA's group armies possess advanced automation systems that integrated field command, providing them with operations simulation and computer plotting tools. This also allows electronic transmission of documents from the group armies level to division and regimental commands. China is readying to integrate information warfare into its geopolitical strategies and concept of People's War. [32]

Most nations in the rest of the world are lagging behind in the development of advanced conventional military power.[33] There is much scepticism about other countries' ability to transform their large and unwieldy conventional forces into high-technology forces that can exploit at least some areas of the RMA. Many countries in the rest of the world have been importers of weapons and not producers.

They simply do not have the scientific and technological base to produce major weapons, let alone high-technology weapons. Nor do they have an advanced civilian high-technology industrial infrastructure that can produce the new information technologies that are contributing to the RMA. Military powers in the rest of the world have shown a marked inability to wage conventional war effectively, as their warfighting is characterised by the domination of land warfare and a systematic inability to use the

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[32] Mukherjee n 30 p 117, also see Ravi Visvesvaraya Prasad *Hack the Hackers*, Hindustan Times, December 19, 2000

[33] Ahmed Hasim n 1

other branches of the military, namely air and naval power, effectively. Often jealous of one another and fighting for a bigger share of the defence budget, the services in many countries do not seem to cooperate much. Very few countries in the rest of the world will achieve this kind of jointness, because it requires organisational flexibility and a decentralised system of command and control. Some nations, thoroughly disconcerted by the RMA, have sought an asymmetrical response to the widening gap between their conventional capabilities and those of the United States. This could be through the acquisition of weapons of mass destruction--chemical, biological and nuclear. Such countries realise that they cannot compete in the arena of high-technology conventional warfare, so they require other means with which to deter U.S. intervention in a regional conflict and make U.S. involvement as costly as possible.

1.3.2 Placing India in the RMA debate

The military applications of information technology was realised at a time when India was reeling under pressure due to the snapping of decades-long dependence on other nations, largely the collapsed USSR, as also the various technology transfer control regimes and sanctions imposed after the 1998 May Pokhran nuclear tests. In fact the advantage of being an IT state could help India come out of the technological backwardness, as most of the civilian IT technologies have military applications.

In terms of the budget allocations for defence in the nineties, there were differences, going by the ideologies of the ruling parities and coalitions, as well as contemporary political and military events and economic realities. The 90s were a period of economic stagnation, which resulted in largest cut ever in defence spending. From the 9.9 per cent maintained between 1984-89, it came down to 1.3 per cent of total government spending in 1989-92. In 1986, India's defence spending was 4 per cent of its GDP. By 1993-94, it came down to 2.44. The high expenditure in defence in the 80s contributed to large fiscal deficits, having adverse effects in the balance of payments.[34]

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[34] Stephen P Cohen, *India: Emerging Power*, Washington DC: Brookings Institution Press, 2001 pp 127-155

Changes in military doctrine, cuts in force structure and recruitment appeared inevitable, given the serious economic situation of these years. Added to this were the militancy and the difficulties in army being deployed to control every internal security situation —insurgencies, communal riots, natural disasters and so on.Developments in the 1990s had come as a grim reminder to India that self-reliance in defence is critical for preserving its national security objectives. A lot of debate was generated during the latter half of the 1990s and much action taken, which continued into the 21st century. The absence of proper strategic thinking was sought to be rectified in those years, the path for which was laid in the various measures of governments in the 1990s.

Chapter 2

India's Security Scenario in the 1990s: Internal and External Dimensions

2.1 Introduction

It is against the background of a decade of global changes in military modernisation and strategic thinking that we have to see India's national security scenario of 1990s. Nineties have indeed been a tumultuous decade. This chapter is a recap of main developments in India in the nineties.

The first priority in ensuring security is that of defending and ensuring the national sovereignty and territorial integrity. The concept of security, in the present however, encompasses a broader canvas. It basically seeks to protect and sustain some fundamental core values on which a nation state as we see it and conceive it has been structured. An external assurance of military security while these values are eroded from within, will fail to achieve security in any way.[1]

2.2 National Security objectives:

India's main security objectives are as follows:

- Defending the country's borders as defined by law and enshrined in the Constitution; and protecting the lives and property of its citizens against terrorism and insurgencies.

- Maintaining a secure, effective and credible minimum deterrent against the use or the threat of use of weapons of mass destruction against India.

- Securing the country against restrictions on the transfer of material, equipment and technologies that have a bearing on India's security, particularly its defence preparedness for which stress is to be given to indigenous research, development and production.

- Promoting further co-operation and understanding with neighbouring countries and implementing mutually agreed confidence-building measures (CBMs)

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[1] Jasjith Singh *'India's Defence: The Challenges of 1990s'* in M Rasgotra et al (eds) India's Foreign Policy in the 1990s, New Delhi: Patriot, 1991, p 69

- Working with countries of the Non Aligned Movement (NAM) to address key challenges before the international community and engaging in co-operative security initiatives such as the ASEAN Regional Forum (ARF)

- Pursuing security and strategic dialogues with major powers and key partners and

- Following a consistent and principled policy on disarmament and international security issues based on the principles of supreme national interest, universality, non-discrimination and equal security for all.[2]

2.3 General Security Environment in 1990s:

The major event that profoundly changed global power equations at the dawn of 1990s was the collapse of Soviet Union, which heralded the end of nearly half a century of Cold War. This has brought about tremendous changes in the way the smaller countries in the world, who were either part of the Cold War blocs or away from it under the umbrella of Non Aligned Movement adjusted themselves to a rapidly changing world. The Cold War was essentially the power struggle between two blocs, often played out in places other than their home territory, mainly in theatres of the third world. Cold War was 'fought' between the capitalist world with democracy as its key ideology led by US and the Communist bloc led by Soviet Union- while those outside these blocs formed the Non-aligned Movement, with India as one of the main players.

The end of Cold War at the dawn of 1990s resulted in a changeover from bipolar to polycentric world Order. Technology and economic power emerged at the forefront of international relations. New points of pressures emerged, while old conflicts remained unresolved, even as developing countries faced concerted pressures in economic, security and military fields.[3]

The end of Cold war weakened the links between regional conflict and great power rivalry, and for some time, there was much hope of evolving collective security for

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[2] *Annual Report* New Delhi: Ministry of Defence, Government of India, p 2

[3] Nancy Jetly *'India's Security Challenges: Perspectives and Prospects,* Strategic Analysis, December 1997 (vol XXI No 9) pp 1243-1263

the region, through a series of confidence building measures (CBMs). But soon regional actors failed to evolve co-operative mechanisms, resulting in the return of external power intervention, who in their turn, pursued their strategic interests.

South Asia seemed to be going through a phase of vigorous democratisation, which slowly waned by the end of the decade. At first Pakistan showed healthy signs of democratisation with periodic general elections leading to relatively peaceful transfer of power, four times in nine years. So was the case in Bangladesh and Nepal. But instability caught up with these governments soon. Political uncertainties in Pakistan were often downplayed by diversion of attention to the 'Kashmir freedom struggle,' thus making it an essential ingredient of the domestic politics. A military solution to the problem was invoked often for the domestic audience, to help defence bureaucracy reign supreme in Pakistan establishment.

Ethno-sectarian conflicts and religious fundamentalism rose in South Asia in the 1990s, oddly enough, as a modern phenomenon, perhaps even as result of modernism.[4] Socio-ethnic tensions lading to centrifugal political mobilisations were a characteristic and one of the determinants of South Asia's national security debate in the nineties. In fact, the fissiparous tendencies of much of the rest of South Asia - Nepal, Bangladesh and Sri Lanka- had strong security implications for India, as much as they affected the respective states. Sri Lanka continued to bleed, with its unresolved national question of ethnic violence between LTTE and the Sinhala dominated government, even as India withdrew its peace keeping force (IPKF) after a humiliating failure of what many considered as an attempt at expanding its military influence overseas. [5] The unceasing violence continued, and it poured into India in the form of assassination of the man who

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[4] Ashis Nandy *'Coping with the Politics of Faiths and Cultures: Between Secular State and Ecumenical Traditions India* in Ashis Nandy et al (eds) Ethnic Futures: The State and Identity Politics in Asia, New Delhi: Sage, pp 135-137

[5] Stephen P Cohen: *India: Emerging Power*, Washington D C: Brookings Institution Press, 2001 pp 148-150

was instrumental in IPKF deployment, former prime minister Rajiv Gandhi. The assassination pointed to the trans-border reach of the terrorist outfit, even as it came as a grim remainder of the security threat posed by sympathisers of the movement at home. There were thousands of Sri Lankan Tamils in squalid camps in Tamil Nadu, some continuing to have overseas militant links.

Somewhere between this relatively classifiable aspects of internal and external aspects of security were the cross-border issues: drug trafficking, light weapons proliferation, refugee crisis, human trafficking, illegal migration, trans-national crime, illegal goods smuggling and trans-border terrorism. These often put socio-economic, political and demographic pressures on the host country- in this case mainly India-because often people fleeing conflict or poor living conditions from neighbouring states settled down in large massed colonies or refugee camps in urban, semi-urban and border areas, bringing with them the strife and often activities against the host.[6] The Maoist movement in Nepal kept close contacts with Indian counterparts. Assam's ULFA had training camps in Bhutan and Northeast insurgents often got support and sanctuary from China. ISI, Pakistan's intelligence agency, had used Nepal and Bangladesh soil to launch subversive activities against India. Often, smaller neighbours have used anti-India rhetoric depending on domestic political and electoral compulsions. Internal and external migration was a cause of friction in many parts of the country, especially in the Northeast. The Chakma movement had spilled much blood, before it was finally solved. Presence of Chakmas in Tripura used to intensify tensions among local inhabitants, as they saw their jobs, resources and land being encroached by the guests, till the problem was solved. In fact, a large number of ethnic conflicts and political or militant mobilisations in the Northeast were based on such 'sons-of-the-soil versus-outsiders' movements.

In a world of confrontation and co-operation, India had to find a right mix of armed forces to address domestic imperatives, regional balance and global challenges.

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[6] Nancy Jetly n 3

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India was seen at the dawn of the 1990s as a potentially resilient and strong democracy with reasonable amount of industrialisation and economic clout, with a GDP growth pegged at seven per cent, boasting of the third largest pool of trained and scientific manpower in the world and self sufficiency in food grains. India had a burgeoning middle class and was emerging as an economic power of some significance on the global scene with an impressive level of defence capability.

India had the fourth largest standing army in the world. It had a credible and self-reliant defence structure, which has been built meticulously in the 1960s, and modernised upto 80s. India's missile development programme was going apace with a fundamental thrust being on indigenous technological capabilities. [7] At the dawn of the 1990s, India was poised to become a major player in the newly emerging World Order.

2.4 External environment:

India shares land and maritime borders with seven countries each. Indian border with Pakistan, China, Bangladesh, Myanmar, Nepal, Bhutan and Afghanistan is 3244, 4056, 4351, 1643, 1751, 700 and 106 kms respectively, which works out to a total of 15,851 kms. India's coastlines are over 7600 km long with island territories on both sides. India's Exclusive Economic Zone (EEZ) extends to over two million square kilometres. The Andaman and Nicobar island territories in the East are 1300 km away from our mainland but close to ASEAN neighbours. With such geostrategic position, and vast maritime, economic and energy resources in terms of EEZ, sea-borne trade, living and non-living seabed resources and equally enormous deposits of oil and gas also brings about major security concerns. India is part of a region with four declared nuclear weapon states, a fifth undeclared but widely perceived as one, and the presence of nuclear fleets of non-Asian countries in Asian waters, who produce and export missiles, with reach sufficient to cover much of India, or in the case of China, all of it. India is also located in the middle of two of the world's major narcotics producing and exporting

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7. K. Subrahmanyam *Challenges to Indian Security* Strategic Analysis: December 2000 (Vol. XXIV No. 9 pp 1557-1576

regions viz; North West Pakistan and Afghanistan on west and Myanmar on the east. Insurgent and criminal groups are part of the global drug trade. Currency counterfeiting and money laundering also are cause for concern. Sino-Pakistan and Pakistan-North Korea defence co-operation, which encompass transfer of nuclear technology, assistance in the missile development programme and the transfer of conventional military equipment to Pakistan is yet another area of concern and potential instability.

2.4.1 China:

Especially after the 1962 conflict and Chinese offer of sanctuary to various insurgent leaders of Northeast, there has been a progressive erosion of trust. The Chinese military presence in Myanmar, Tibet, the continuing supply of arms and nuclear material to Pakistan, the refusal to accept Sikkim's accession to India, continuing occupation of a sizeable chunk of Arunachal Pradesh and naval expansion totally unbecoming for a non-maritime country were all factors which contributed to what ultimately led to a defence minister calling China enemy number one.[8] There is no underestimating of Chinese military power, even as much of India's border with the country remains unresolved. Chinese defence modernisation is a matter of concern to Indian defence planners. It already has a military build up in Tibet, and is vexed by India's offer of sanctuary to its spiritual leader the Dalai Lama, and has exhibited its military might in South China Sea. China continues to challenge India's role in South Asia as a regional power, through overt and covert methods. It has engaged in arms sale to Pakistan, Bangladesh, Sri Lanka, and Myanmar and had evidently given nuclear help to Pakistan. The supply include conventional weaponry, ring magnets needed in nuclear fission, and M-11 missile. It is reported to have provided Burma with arms worth 1.6 bn US dollars. It has also helped India's neighbours in constructing naval, electronic facilities and in modernisation of naval bases. A combination of geo-political proximity of national rivalry, unresolved borders and memories of a bitter war motivates India's policy towards China, with undercurrents of competition and containment.

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[8] Praveen Swami, *A Hawkish Line on China*, Frontline, Vol. 15, No. 11 May 23 - Jun 05, 1998

China's People's Liberation Army (PLA) has been undergoing a vigorous period of military modernisation. It is not clear that the PLA high command fully understands the culture of high-technology warfare, having a strongly-held belief in capital-intensive approach to war. It may not be easy for China to accept a decentralisation of command and control. But Chinese military thinkers are advocating a string of measures to develop RMA capabilities.

There are also reports of indigenous aircraft carriers being built. Chinese military R and D also hope to take benefits of the civilian sector, and access to imported technology. Chinese expenditure on current RMA-type weapon systems is largely concentrating on electronic components, and it often copies the western technological know-how.

One or two of PLA's group armies possess advanced automation systems that have integrated field command, providing them with operations simulation and computer plotting tools. This also allows electronic transmission of documents from the group armies level to division and regimental commands. China is readying to integrate information warfare into its geopolitical strategies and concept of People's War.[9]

It should be of great concern to Indian armed forces that China had prepared detailed plans to cripple the civilian information infrastructures India, apart from that of Taiwan, USA, Japan and South Korea. Instead of attacking military or political targets in these countries, China expects to target their financial, banking, electrical supply, water, sewage and telecommunications networks. In its war exercises, Chinese soldiers simulated attacks on the telecommunications, electricity, finance and television sectors of Taiwan, India, Japan and South Korea and specialists are preparing methods of seizing control of networks of commercial internet service providers in these countries.

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9.   Bappaditya Mukherjee *China and the RMA* in Kanti Bajpai and Amitabh Mattoo (eds) *The Peacock and the Dragon : India-China Relations in the 21st Century* Har Anand: New Delhi, 2000 p 109

2.4.2 Pakistan:

Pakistan's intelligence agency Inter Service Intelligence (ISI) has been sponsoring a proxy war in India, promoting disruptive activities, throughout the 90s. The ISI has developed close linkages with Islamic fundamentalist outfits like Lashkar-e-Taiba, Hizbul Mujahideen and Harkat-ul-Mujahideen. ISI funded their activities like paramilitary training and procurement of arms to wage war against the Indian state.[10] This has led to a low-intensity conflict, on which India had to spend a lot on military hardware as well as manpower.

ISI nexus with fundamentalist parties provided the agency with manpower that can be mobilised as street power. Pakistan's covert war- though infiltration of ISI agents into Indian territory proved relatively feasible till early 1990s. These agents were launched through trans-border operations as Pakistani para-military forces provided covering fire for them to enter India. The terrain suited for infiltration through border especially through Akhnoor in Jammu and Kashmir, through Punjab and Rajastan or Bhuj in Gujarat.

ISI strategy in early 1980s promoted militancy in Punjab and encouraged Khalistan secessionist movement and trans-border support to militants groups in the Northwest and Northeast. After India quelled Punjab militancy, from the early 1990s, Pakistan supported terrorism in Jammu and Kashmir, as an extension of its national security and foreign policy towards India. After Soviet withdrawal from Afghanistan, ISI, which had been spearheading the Afghan jihad against Soviets, was able to focus attention on India.

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10. Bidanda M Chengappa *Pakistan's Fifth Estate: ISI Directorate*, Delhi Papers 12, New Delhi: IDSA, 2000 p 10-15

Pakistan also exploited the anti-Indian sentiment in other Islamic nations, after the demolition of Babri Mosque in December 1992. All extremist and terrorist organisations sprouting out of Pakistan exploited Islam and called to Islamic solidarity as a motivating factor in their world-wide Jihad, or Islamic Holy War.[11]

ISI has also been actively assisting Bodo extremists in Northeast and the People's War Group in Andhra Pradesh. Islamabad opened several training camps in the territory of Azad Kashmir close to the Line of Control (LoC) with India, trained hundreds of terrorists, inducted them into Punjab for stepping up militancy. It was a retaliatory game plan to avenge India's support to Bangladesh rebels, which led to East Pakistan's separation from West Pakistan in 1971.

ISI had secured help of the trans-border smugglers for infiltrating the militants and smuggling of arms and ammunitions and explosives. Taking advantage of Indo-Nepal trade, free and safe-passage agreements, ISI used Nepal as a convenient sojourn and spearheaded militants operations into Jammu and Kashmir and other parts of India, thus making Nepal a springboard of terrorism.

There were also reports that ISI had a hand in narco-terrorism in Jammu and Kashmir and the Northwest region of India. Pakistan had been nurturing ethnic communities of Federally Administered Tribal Agencies (FATA) to smuggle drugs and weapons to India through the unconventional border routes. A large number of tribals from Pakistan's Northwest Frontier Province have infiltrated into the valley to smuggle heroin, weapons and explosives. Many of them being veterans of Afghan War, they used their arms and ammunitions to impart training to youth of Kahmir valley for joining the various militant outfits. [12]

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[11] B P Saha *Trans-border Terrorism: Internationalisation of the Kashmir Tangle*, New Delhi: Har Anand, 1995 p-127-128

[12] Ibid.

Meanwhile, with help and blessings from America and later China, Pakistan has managed to build up a strong defence industrial complex. It has moved on a path of indegenisation and modernisation, despite huge socio-ecomomic consequences of that country concentrating its financial resources on defence. Pakistan's defence industrial complex consists of 14 factories and 6 subsidiaries, it has been using modern technologies like robotics, CNC machines, micro-processing controlled production, and computer automation through CAD and CAM and flexibility manufacturing systems. Pakistan Ordinance Factories (POF) is one of the largest producer and exporter of engineering goods in the country. The Heavy Rebuild Foundry Project (P-711), established with Chinese help to rebuild T-59 tanks was reorganised as Heavy Industries Taxila (HIT) in 1992. HIT has rebuilt, modified and upgraded over 1545 T-series of tanks, 3225 tank engines and over 223 armoured fighting vehicles (AFVs) that it got from US. Pakistan has been using a combination of purchase and indiegnous production for modernising its forces. Some 300 T-80 (UD) tanks have been acquired from Ukraine. The gun factory, established with Chinese assistance, has been producing 105mm to 155mm calibre guns, and gun barrels for tanks. For a small and often economically challenged country, Pakistan has developed its own Hatf series of ballistic missiles. On 6 April 1998, it test fired its intermediate range surface-to-surface ballistic missile Ghauri (Hatf-V) with a range of 1500 kms and a payload of 700 kgs. Pakistan has also developed and delivered to the Army Anza, a shoulder-fired, infrared guide surface-to-air missile, and Baktar-Shikan anti tank guided missile weapon systems.

2.4.3 Central Asia:

Central Asian Republics (CARs) figure in India's securitya nd strategic equations in three significant ways. As a source to meet its energy needs with vast reserves of oil and gas, as the next market after Soviet Union's collapse for arms and military hardware, and as a region with potential to grow fundamentalism, thus bringing stakes for Indian in ensuring political stability and regional balance.

The newly emerged CARs- Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan-had witnessed political instability and religious fundamentalism. Their instability is detrimental to India's interests in the untapped reserves of oil and natural gas. These same resources had made CARs an area of competition for the West, US, China, Russia, Iran and Turkey. US is seeking its own strategic equations in the region in exploiting and routing the region's enormous energy resources, in pursuit of establishing an independent energy supply system. The conflicts in the region are increasingly getting mixed with oil politics. This applies not only to the oil exporting countries but to transit states. The prospects of routing the oil/gas pipelines from Central Asia to South Asian region and further towards the East and Southeast Asian markets are also great. The proposed pipeline project from Turkmenistan via Afghanistan to Pakistan and India is of great interest to India. However, it will have to confront a number of geopolitical and techno-economic issues that are yet to be resolved adequately. [13]

Big power rivalries over their rich economic resources, especially hydrocarbons; the perennial flash point of Afghanistan, the volatility of the Tajik situation; religious fundamentalism, cross-border terrorism and arms and drugs trafficking underline the complexities of the security situation in Central Asia. The stockpile of weapons in Afghanistan may reach across the border particularly in Central Asia, which would have negative political impact on Tajikistan, Uzbekistan and Turkmenistan.

Central Asian countries and India have a common stake in countering religious extremism and terrorism and promoting peace and stability in the region. Religious extremism, terrorism, drug trafficking, ethnic conflicts and the crisis in Afghanistan have a detrimental effect on the security of the region as a whole. [14]

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13. P Stobdan *Regional Security Issues in Central/South Asia and Potential for Co-operation*, Strategic Analyis, Vol XXII, No 10, January 1999 pp 1561-1576

[14] Meena Singh Roy *India's Interests in Central Asia* Strategic Analysis March 2001 (Vol. XXIV No. 12) p 2275

2.4.4 Afghanistan

The volatile situation in Afghanistan continued to plague India, as it had fundamental geo-political stakes in that country. The Taliban's fundamentalist regime established in 1996 constituted a serious threat to India's secularism, as spillover of these ideologies, violence and narco-terrorsim was witnessed in Kashmir. Throughout the 1990s, much before the US entered in helping the Northern Alliance, India kept contacts with major secular groups within Afghanistan.

The Taliban regime in Afghanistan was an extension of Pakistan's use of terrorism as state policy, to achieve its goals vis-à-vis India in particular and the region in general. The idea for the creation of Taliban- religious students trained from Pakistan's Madrassas- came from Major General (retd) Nasirullah Beg, an interior minister of Benazir Bhutto's cabinet, General Prevez Musharaff, who was then Director General of Military Operations and Lt. General Mohammad Aziz who was then the Deputy Director General of ISI and in-charge of ISI operations in India and Afghanistan. The Taliban militia was officered, trained, and guided by Pakistan's ex-servicemen, and the administration in Taliban-controlled areas were largely run by retired Pakistan bureaucrats. The budget of the Taliban government was heavily subsidised by Pakistani exchequer. Control of Afghanistan through Taliban helped to keep Pakistan economy afloat through the 'heroin money.' [15]

Practically all Islamic extremist and terrorist outfits in various parts of the world including Egypt, Saudi, Yemen, Central Asian Republics, Chechnya and Dagestan in Russia, Xinjiang in China, Jammu and Kashmir in India, and Southern Philippines were all born out of ideas conceived in the battlefields of Afghanistan of the 1980s and spread from the mosques and madrassas of Pakistan subsequently.

Spill-over of external strife in internal security of India is best exemplified in the Afghanistan crisis, which continued to be war-ravaged throughout the last decade. Often,

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15. B Raman, 'Islamic Fundamentalism', paper presented in national seminar on Islamic terrorism, New Delhi, November 25, 2000

Pakistan siphoned off arms meant for Afghan mujahideens fighting the Soviet Occupation by the US, China and Saudi Arabia to India. Vast quantities of these arms went into militancy affected areas in Punjab, Kashmir and the Northeast, which was further used to create anarchy and destruction as was evident in the 1993 Mumbai serial blasts. There is a relationship between border-state insurgency, drug trafficking and terrorism, the actors often working with underworld elements, extortionists and gun dealers.

2.4.5 Russia:

Russia is included in this discussion not as a specific security threat, but as a natin on which India's security needs and worries are intermingles. Russian military supplies to China and thereby to Pakistan have often been a cause of worry. Though Russia has been one of India's key suppliers of military hardware, the two countries do not share a strategic partnership. Russia in fact has a strategic alliance with China and is now largely dependent on West. It was evident when it gave in to pressures in the areas of sensitive dual use technology like the cryogenic engine. [16]

With the collapse of former Soviet Union was significant for India, as it lost it's most assured and continuous supplier of military hardware and spares. It put a stop to India's military activism of most of the 80s, at a time when insurgencies raged in Punjab, Northeast and Jammu and Kashmir. [17]

Soviet Union had a dominant position among India's major arms suppliers until its demise in 1991, accounting for almost 70 per cent of India's military imports. Practically all the frontline armour and mechanised units of the Indian army had used the Soviet-made Equipment. Anti-aircraft artillery, including surface-to-air-missiles batteries and all but seven Indian Air Force squadrons had been using various versions of Soviet

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[16] Shashikant Jha *'Challenges of rediscovering Past Linkages'* in Sham-ud-din (ed) India and Russia: Towards a Strategic Partnership, New Delhi: Lancer, 2001, p 38

[17] Stephen P Cohen n 5 p 152

era MiGs, illyusins and Mi-Series of Helicopters. Most of the Navy's submarine destroyers and Missile boat divisions had Soviet equipment.[18] .However, after the USSR's split-up to almost the time of Kargil, there was a virtual standstill in India's military acquisition. In fact India paid a heavy price for its Soviet relationship, in the form of delays in the supply of spares, ammunition and fulfilling maintenance contracts. Spare shortage was acute for its fleet of MiG-29s in early 1992.

While India continued to buy defence hardware for three long decades, this was not always accompanied by technology transfer and joint production ventures. Neither were such production ventures synchronised with indigenous research and development. An indigenous engine for Light Combat Aircraft (LCA) and Main Battle Tank thus remained a distant reality, even though India has been assembling Soviet and Russian air craft and tanks for over 30 years.[19]

2.4.6 USA:

Though Indo-American relations in most of the nineties are best described as aloof, US has figured in India's security concerns in significant ways. Indian defence establishment was concerned at the various military supplies to Pakistan, American naval presence in the Indian Ocean and the various technology denial regimes led by the US.

Supply of American military hardware reached directly to Pakistan and in an indirect manner through China. It was strongly resented and even feared by Indian authorities, as they held that American military technology in China is not only a direct threat to India but it also circuitously reached Pakistan. India's gaining of military technology from Soviet Union was a constant cause of friction in Indo-US relations. India wanted to get more advanced technology systems from US, which also had military implications, such as the Cray XMP supercomputers, but US often refused to comply. [20]

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[18] Shashikant Jha n 16 p 39

[19] Ibid p 41
[20] Aqueil Ahmed *'US-India Science and Technology relations: A socio-political Analysis'* in Ashok Kapur et al (eds) *India and the US in a Changing World*, New Delhi: Sage, 2002 pp 43-69

In most of the nineties India's ties with US were not very warm. US was seen showing insensitivity and disregard for India's vital security concerns in the region. Throughout the 1990s, Southern Asia and India in particular did not figure much in the strategic goals of the US. India was a much-neglected country and had been invisible to many American policy makers over the past several years. [21]

2.4.7 Maritime security:

India is essentially a seafaring nation, with vast maritime frontiers, from Arabian sea to Bay of Bengal and Andaman Sea in East. These areas contain vital seaborne trade routes. India has a coastline of 7516 kms including 132 km of Lakshadweep, 1962 Kms of Andaman and Nicobar and it has 2.2 million square kilometres of Exclusive economic zone. The surveillance of this EEZ is vital in our economic security to protect natural resources and marine ecological environment.[22]

Indian Ocean region, therefore, is of vital significance in India's security and economic well being. The preservation of strategic waterways is crucial, as a sizeable chunk of economy depends on maritime trade. Major sealanes of Communication pass through the Indian ocean. The Persian Gulf accounts for 60 per cent of the world's energy needs, and the sealanes of communication pass through Indian ocean, making it strategically important.

2.5 Internal security environment:
2.5.1 Jammu and Kashmir:

One of the most violent and conflict-ridden areas has been Jammu and Kashmir. It is quite a complex security problem, where internal and external threats intermingle with military and non-military issues. The situation in the state progressively worsened, turning it into a virtual military garrison.

The low intensity conflict has almost turned into a regular war, given the arms and ammunitions used by militants, which are more sophisticated than those of the

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[21] Stephen P Cohen, *Testimony Before the Near-East and South Asia Subcommittee of the Senate Committee on Foreign Relations*, Washington D C : Policy Briefs, Washington D C: Brookings Institution Press, May 25, 1999 pp 1-5
[22] Raja Menon and R K Dhawan *The Indian Navy* New Delhi: Indian Naval Headquarters, 2002, pp 14-16

military. The counterinsurgency (COINT) operations in the state took a heavy toll on the armed forces, both in terms of human lives as well as the morale. In fact, much of the army's modernisation was necessitated by the conditions in which it fought the low intensity conflict in the state. With cross-border support to the militants from Pakistan, India was at the same time fighting intelligence warfare, and a covert/proxy war while trying to bring about an amiable political solution to the problems of the Kashmiris.

The year 1990 saw an eruption of violence, underlining the isolation and alienation of the people from their rulers. There was a growing sympathy and overt of covert support for the militant movement which started gaining momentum with cross-border support in the early years of the decade. With time, the forces on ground changed, as the leadership of dissenting movements changed over to foreign and cross-border mercenaries. The assembly and general elections witnessed heavy-handedness from law enforcers, leading to further discontentment in people.[23]

Pakistan tried to funnel in through ISI a proxy-war, in which Pakistan-based terrorist organisations played the major role. Following the nuclear tests of 1998, Kashmir was seen as one of the most dangerous places in the world and a potential nuclear flash point. Cross-border terrorism has claimed an estimated 26226 lives between 1988 and 2000 in around 43956 incidents of terrorist violence. Of these casualties 10310 (40 per cent) were civilians, 3520 (13 per cent) were security forces personnel, and 12396 (47 per cent) terrorists.

Cashing in on the general discontentment at massive corruption and what looked like an oligarchy with rigging of elections, Pakistan trained the so-called jehadis who wanted to wage war against India. Training camps were soon set up in Pakistan-occupied Kashmir, and the first group Pakistan approached through ISI was the Pakisan based militant outfit Jammu and Kashmir Liberation Front (JKLF).

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[23] See B P Saha *'Trans-border Terrorism: Internationlisation of the Kashmir Tangle* New Delhi: Har Anand, 1995, Christopher Thomas *'Faultline Kashmir'* London: Brunel Academic Publishers, 2001

By 1992, there were over a hundred such groups, who often fought with each other, armed with lethal light weapons. Groups such as Harkat-ul-Ansar, Lashkar-e-Toiba and Hizbul Mujahedeen based in Pakistan, were spreading a pan-Islamic fundamentalist ideology. Soon JKLF disappeared from the scene. The madrassa culture that provided Taliban fighters to Afghanistan also gave cannon fodder for the militancy in Jammu and Kashmir, both actively promoted by Pakistan. Foreign mercenaries started taking part in the Jihad around 1994. Many militants who earlier had grand and romantic ideas and ideals, soon got tired of the huge presence of foreign fighters, and some of them became pro-India, thus helping the security forces in mid 90s.

Soon new groups took over the militancy, oriented by Afghan guerrillas, Sudanese and West Asian mercenaries who trained either in Afghanistan or in West Asia. They often dwarfed the COINT operations of security forces, as they were armed with assault rifles, rocket launchers and grenades, while also training and supporting highly motivated mujahideen inspired by religious fanaticism, ready to sacrifice their lives for the holy war. The nature of arms and ammunition seized from the militants in the State indicated that the focus of insurgency has been gradually shifting from selective killings to generating an atmosphere of terror in the state through bomb explosions. The fidayeen (suicide squads) were responsible for such direct attack on military posts, administritative and government buildings as also on civilians.

The early nineties was marked by an excessive reliance on security forces, even as several political steps were taken in the later years. Soon, what could have been a job of police and paramilitary forces became dominated by the armed forces, thus affecting its resources and finances. Security personnel constituted a rising percentage of casualties of the conflict. Over time, indigenous and foreign terrorists have converted the insurgency into a profitable enterprise. The proxy war in the State gained prominence in the international agenda after the 1998 nuclear tests, the 1999 Kargil flare-up, and the IC 814 hijacking in 1999. Terrorist outfits active in J&K and based in Pakistan continue to raise finance and operate training camps within that country.

2.5.2 North-eastern states:

The insurgency of northeastern states, with different reasons for different states and militant outfits, has been another security concern. From sporadic incidents of violence, they sometimes turned into internecine fighting leading to ethnic cleansing, often requiring the armed forces to intervene. A disturbing trend has been the support and sanctuary offered to these groups by neighbouring and foreign countries, as well as by militant and terrorist outfits abroad. Often, they got training from these nations. Armed forces also noticed with alarm the supplies of arms reaching these outfits from abroad. While the reasons for insurgency were perceived injustices at home, the reach of some of the prominent outfits crossed the borders of the country. At first seen as a problem that could be handled by proper policing and use of paramilitary forces, the North-eastern insurgency often worsened, requiring military responses, like the Operation Rhino in Assam. [24]

The anti-foreigners agitation of Assam, generally aimed at the Bangladeshi migrants, took a violent turn secessionist tendencies. United Liberation Front of Asom (ULFA), established 1979, had declared secession as its goal. The militant violence took unprecedented heights in 1990. Government lost control of the situation, and the state was put under President's rule and ULFA was banned. The army had been inducted and the 'Operation Bajrang' of September 1990 and April 1991 led to the arrest hardcore militants and large haul of arms. Operation Bajrang succeeded in giving a semblance of normalcy. But as ULFA soon resumed its campaign and army launched Operation Rhino in September 1991. 4,000 ULFA militants surrendered. But over time, the resilient ULFA gained in strength and continued its activities, armed with new military hardware and

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[24] The discussion on the Northeast states is drawn from these sources: Sreeradha Datta *'Security of India's Northeast: External Dimensions'* Strategic Analysis Vol XXIV, No 8 PP 1495-1516, Sreeradha Datta *Northeast Turmoil: Vital Determinants* Strategic Analysis (Vol. XXIII No. 12) pp 2123-2133, Dinesh Kotwal *'The Contours of Assam Insurgency'* Strategic analysis March 2001 (Vol. XXIV No. 12) pp 2219-2233

training camps across the border in Myanmar, and later in Bhutan. In April-May 1995, the Indian and Myanmarese armed forces launched Operation Golden Bird along their border, killing 50 militants. A Unified Command structure was formed to co-ordinate anti-terrorist activities in 1997. This has weakened the ULFA to a large extent, driving its senior leadership into exile.

Bodo insurgency is another problem in in the state. Bodos, one of the earliest settlers demanding better social, political and economic conditions. A number of outfits have emerged following tensions between the Bodos and the Assamese. These outfits engaged in killings, explosions, arson, and attacks on police stations. On February 20, 1993, between the Government of India, the Government of Assam and Bodo leaders, have discussed creating the Bodoland Autonomous Council (BAC) within Assam. But since Bodo villages are not contiguous area, the demarcation of the jurisdiction of the BAC remains a problem. Muslim migrants in Assam have also shown tendencies towards militancy. The Muslim United Liberation Front of Assam demands a separate State bringing together the five border districts in Assam, which now have a Muslim majority.

Manipur's ethnic and cultural diversity has led to internecine conflicts among different ethnic groups and tribes. The Meiteis, more than 50 per cent of the population, occupy only one-tenths of the State's area. Meiteis took up arms, at the perceived injustices of the reservation system. They do not belong to the Scheduled Tribes, while the hill tribes enjoy job reservation, protection of their lands from settlement and ownership by non-STs. Outfits such as United National Liberation Front (UNLF) want to achieve independence and establish a socialist society. Some such groups even established government-in-exile, backed by Pakistan. Some of the Meitei rebel leaders, detained in Tripura jails along with Naxalite-leftwing extremists were indoctrinated into Maoist- thought. After their release they got tacit Chinese support and formed the People's Liberation Army (PLA). After a series of major crackdowns in the late 1980s, PLA reorganised and formed a political wing called the Revolutionary People's Front (RPF) which sought secession of Manipur from India. RPF established a government-in-exile in Bangladesh's Shylhet district, PLA had set up two camps in Myanmar and five in

Bangladesh in which over a thousand recruits received arms training. The People's Republican Army (PRA) that was set up in the early nineties instigated the communal clashes. Soon, a section of the Pangals community established links in Bangladesh and with Pakistan's Inter Services Intelligence (ISI) for weapons and assistance. Besides, new outfits such as People's United Liberation Front (PULF), NorthEast Minority Front (NEMF), Islamic National Front, Islamic Revolutionary Front (IRF) and United Islamic Liberation Army (UILA) had been formed in order to protect their respective communities.

The conflict between the Nagas and the Kukis - a major tribal group in Manipur, constituted another problem. Kuki National Army (KNA), Kuki National Front (KNF) and many others had been struggling for a separate State within the Indian Union since the late eighties. These outfits engaged in a bitter struggle to control drug trafficking and smuggling of contraband through the border town of Moreh. The state is now a polity polarised along ethnic lines. Several tribes had launched their own terrorist groups in recent years. Internecine conflicts, particularly between the Kukis and the Paite had peaked in 1997-98.

Like all Northeast states, the problem of ethnic variety and tribal clashes plague Nagaland, with its 17 major tribes and over 20 sub-tribes. Nagas were the first to revolt against the Indian government, under the aegis of the Naga National Council (NNC) for a sovereign Naga state. With a claim that 99% of the Naga people supported them, the NNC boycotted the general elections and launched a violent secessionist movement. After an army crackdown, the leaders escaped to the then East Pakistan and later to London. But some140 activists of the NNC, who had gone to China for training, repudiated the Shillong Accord and formed a new underground organisation called the National Socialist Council of Nagaland (NSCN) under the leadership of Thuengaling Muivah, Isak Chisi Swu and S.S. Khaplang on Myanmarese soil. With the passage of time, the NSCN emerged as the most radical and powerful insurgent group. The various insurgent outfits in Nagaland are divided along clan and tribal lines.

The influx of Bengali refugees from East Pakistan following partition led to the indigenous people of Tripura consisting of 19 tribes, who were once 95 per cent, being reduced to just 31 per cent at 1991 census. It led to discontent in the tribals, who became a minority in their own land. Soon they saw the control of trade and business and government jobs going to the immigrants. Some tribes formed outfits like Tripura Upajati Juba Samiti (TUJS), Tripura Sena (Tripura Army) , Tripura National Volunteers (TNV) to fight for an independent tribal Tripura state. The Tripura Tribal Areas Autonomous District Council Act in 1979 passed by the state government was opposed by a section of the Bengali population, who also launched a militant organisation called Amra Bangali (We Are Bengalis). Communal clashes broke out in several parts of the State in which about 1,800 people lost their lives .

Chapter 3

Indian Armed forces and the RMA

3.1 Introduction:

RMA is basically about changes in military technologies, doctrines and organisational concepts, referring collectively to a new attitude towards the concept of warfare. It emphasises better use of mechanised, capital-intensive and highly professional armies and better defence management. At a parallel level, RMA stresses the need for interface between defence and private industry.

The present chapter uses RMA concepts as a yardstick to assess the performance of Indian armed forces and its modernisation drive in the nineties. We will examine Indian armed forces using some basic principles of RMA discussed in the first chapter, wherever it apply to the services. We will see how our weapons and platforms have been upgraded and also take a look at the precision-guided weaponry, namely, the missiles under the integrated guided missile development programme (IGMDP). We will also see how each service measures up to the concept of joint operations in the Indian – or South Asian context.

At the dawn 1990s India was at a virtual standstill in terms of military acquisition. There was an increasing need to concentrate on domestic insurgencies and it took nearly half the decade for India to come to grips with the loss of USSR as its key military supplier.[1] The IPKF, bogged down in someone else's civil war, incurred heavy casualties and was withdrawn in early 1990. Sri Lanka was India's Vietnam and it was not until Kargil operation nine years later that army regained its self-confidence and public esteem.[2] Between January and May 1990, India went through several crises, which in a way defined the security paradigms of the nation for the rest of the decade.

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1. Stephen P Cohen: *India: Emerging Power,* Washington D C: Brookings Institution Press, 2001 p 154-155

[2] Ibid pp 146-47

They include the Kashmir insurgency with tacit Pakistani support; weak governments in both India and Pakistan and Pakistan's nuclear threat.

At the dawn of the decade army was traumatised by the Lankan operation, air force totally dependent on outside suppliers and navy still under-funded and dependent on outside technology.[3] As Russian companies went out of business and those who remained demanded heavier prices in ready cash, India prowled Russia and the newly emerged Central Asian Republics searching for spares and machinery for its military hardware. This resulted in a degradation of Indian military readiness that lasted through most of the 1990s. The Indian army in the 21st century largely continues to have tactics and military hardware developed in the first half of 20th century. It has the task of fighting a low cost insurgency fuelled by Pakistan while preparing for a full - scale war, under NBC conditions.

In the previous chapters, the military and security background of the 90s have been discussed, which brought about far-reaching changes. The present chapter is a discussion on the Indian armed forces, its capabilities; vulnerabilities and future needs based on the concept of RMA. The yardsticks for the services are as follows: Man power and distribution, platforms, high-tech weapons, asymmetric warfare, precision engagement, mechanised forces, use of Information Technology, Logistic capabilities.

3.2 ARMY:

3.2.1 Manpower:

As discussed earlier, one of the causes of the new RMA has been the increasing cost of maintaining standing armies. Cost-cutting measures all over the world involved reducing manpower, while optimising existing force levels by mechanising infantry and introducing force multipliers. The idea was to evolve a 'lean and mean' fighting machine.

With around 10,00,000 personnel, Indian army is often referred to as the world's fourth largest in terms of sheer numbers. At the beginning of the decade, Army was

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[3] Ibid pp 150-51

undergoing a mechanisation and streamlining drive, which led to decrease in manpower to 9,50,000. It was aimed at evolving Army into a lean and mean force. The number of troops was between 9,40,000 and 1050,000 active and some 2,50,000 reservists.

While RMA enthusiasts would stress a lean and mean fighting machine, Indian army's case has been one of manpower shortage at the officer levels. It was not because men were being replaced by high-tech machines, but simply because of high retirement ages and lack of enthusiasm for taking up a career in army. In the early 90s the world's fourth largest army has few men to fight, and that the army is greying. After intake of 32,420 people in 1989-90, there was still a shortage of 4635. The portion of the army budget dedicated to payroll and benefits for company and battalion level officers fell 60-70 percent between 1947 and 1982, spurring an exodus of middle level officers. Slow promotion rates and relatively mature age of mid-level officers further complicated the personnel problem. Army has shrunk by 120,000 men between 1990 and 1999 though India still has over a million soldiers under arms.[4]

Comptroller and Auditor General of India's 1991 report expressed concern at the alarming fall in army recruitment. From the 1,02,143 of 1983-84 it went down to 36,536 in 1990-91 which is a 64% fall. The lowest has been in 1989-90 when it went to 32,420. In 1990-91 the intake was 30,538 and yet a shortage of 32,88 remained.[5] In 1994, the officer cadre shortfall in army was between 9000 and 12,000 whereas between 1990 and '93 there were 2031 premature retirements.[6] Unfortunately the situation has not changed over the years.

4. Timothy D Hoyt *Modernising Indian Armed Forces*, Washington DC: Joint Forces Quarterly, Summer 2000 p 18

5. R Prasannan *'Indian Armed Forces Unfit to Fight'* New Delhi: The Week, August 1991, also Shantanu Guha Roy *'The Army Wants You'* New Delhi: Outlook, June 21, 1999, p 50

6. Thakur Kuldip Luthra *'The Lot of the Services'* New Delhi: Indian Defence Review, March 1995

The severe shortage of young officers was felt in 1999-2000 also, which led to increased intake of short service commissioned officers. In fact, it is largely these officers at the platoon and company levels who fought the Kargil war.

Army has plans to reduce manpower by 50, 000 by 2002, but analysts say it is not possible, as additional manpower is needed to physically man all posts in Kargil. They suggest giving retirement to lower ranks, especially in non-officer crops at 30, with the same option available at officer level, which could help decrease pension bill and fill young blood in army. Any personnel downsizing will also have to take into account the need to man defensive position along porous and unsettled borders and commitment on the low – intensity conflicts. But smaller, mobile, technologically oriented land forces for operation in the plains is desirable, since a large part of modernisation will have to come from depletion in manpower.

3.2.2 Weapon plat forms:

India is believed to have 3,414 main battle tanks (MBTs) and 90 light tanks. In 1990, India had 700 armoured personnel carriers. They were BTR 50/60/152 or OT 62/64s. The mechanised infantry division had some 500 BMP-1 or BMP-2 vehicles. Most of India's tank fleet were of Soviet origin or from the CARs. While there were attempts at producing some hardware indigenously in the decade under review, strategic community was divide about its reliability. Examples include the Arjun main battle tank, INSAS rifle and 'Sarvatra' Infantry Fighting Vehicle.

In early 90's itself, the urgent need for modernising and expanding MBTs was felt. India was yet to go through a process of stepped upgrading of tanks and to complete manufacturing process. [7]

The indigenous Arjun MBT was considered by some as a "miserable failure" and proof that India was as yet incapable of tank design and manufacture, whereas the Defence Research and Development Organisation (DRDO) which designed it, maintained

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[7] Baranwal S P (ed) *Military Yearbook*, New Delhi: 1991, pp-145-146.

that it is the "best choice". The tank in fact used a collection of western assemblies including German 1400 HPO MTU engine.

Conceived and designed by DRDO, it was planned to be rolled out in 1990 but was dogged by long delays.[8] When it was launched finally in February 1993, India boasted of being part of an exclusive club of indigenous manufacturers of state-of-the- art MBTs. At Rs 70 mn, Arjun was considered the cheapest MBT in the world coming at the end of a two-decade old project that started in 1974. There were plans to produce 126 Arjuns, which would replace Army's two armoured regiments. In fact Arjun had 35 percent imported content.[9] Despite a variety of capabilities claimed by DRDO, four T-90 were imported from Russia for trials in 1999, followed by orders for 300 more Russian tanks.

The T-72 M1s are being upgraded with better fire control systems. The older T-55 and Vijayantas are undergoing minimum upgrades. In 1999, at the peak of Kargil conflict did army acquire the protected vehicles against improved explosive devices in Northern and Eastern commands. It also contracted snowmobiles and all terrain vehicles. First orders for series production of 124 Arjun MBTs were given. More BMP-2s were planned to be added. 'Abhay' Infantry combat vehicle with 40mm AG2 and 440 mm cannon and ATGW launcher with 4 rounds had been developed.[10]

3.2.3 High-tech weapons:

India faces huge maintenance problems, as its weapon systems are based on Russian technology and their supply of spares is not satisfactory. India's local servicing facilities are not very impressive either. While India would like to boost its arms industry, big-ticket items are being added through foreign purchases. Russia remains India's principal weapons source. [11]

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[8] *'MBT is the Best Choice'* New Delhi, Times of India, October 29, 1993.

[9] *'Indegenous Tank Launched,* New Delhi: Times of India, February 28, 1993.

[10] Annual Report 2000-2001, Ministry of Defence

[11] Jonathan Marcus, *India and Pakistan: The Military Balance,* London: BBC available at news.bbc.co.uk/hi/english/world/south_asia/newsid_1735000/1735912.stm

In the post-Cold War era, India had the possibility of rapidly expanding arsenal by buying at cheaper rates the weapons disposed off by East European nations. However, this opportunity was not properly utilised. A lot of procurement for army was done during and after the Kargil conflict, in what essentially was a panic reaction. They include anti-material rifles, sniper rifles, AK-47 rifles with under-barrel grenade launchers, multiple grenade launchers and rocket launchers. Short-range battlefield survival radars and special equipment were inducted for a few infantry units in Jammu & Kashmir as also the indigenously developed 'eagle' mine detectors.[12] Some of the rather controversial purchased like the Bofors Howitzers for the artillery, which led to a decade-long count battle on kickbacks, have performed well in Kargil. But enquiries later into the arms deals of the period have disclosed gross irregularities.

Interestingly, India still has human foreword observers for its artillery support, instead of weapon-locating radars. These observers give data on target to gun positions on radio net. They also have forward armoured columns with observation officers as also air observation posts operating in dangerous conditions.

India's attempts at developing indigenous small arm had been plagued by delays and below-standard performance. India has indigenously developed 5.56-mm calibre Indian small arms (INSAS) rifle, a light machine gun, the bulk production for which began in 1999.[13] While it is a great achievement to have locally developed a light machine gun, one should consider that this rifle was first inducted in Army in 1993. That too after over 13 years of design and test.[14] Infantry uses 7.62x51 mm SLR semi-automatic rifle, which was being replaced by AK 74 in some units in 1990.

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[12] Ministry of Defence, Annual Report 1999-2000, p 21
[13] Ibid p 65

[14] '5.56 mm Rifle Inducted in Army New Delhi: Times of India, June 15 1993

In 1999, especially during Kargil, there were urgent purchases in small arms, artillery ammunition and acquisition of infantry equipment especially for mountain warfare. While a variety of arms ammunition and force multipliers were ordered in the aftermath of Kargil, much of it reached well after the war was over.

Indigenously developed 125 mm fine stabilised armour piercing discarding sabot underwent production in 1999. Soft-core ammunition for T-72 tanks was fully established in 1999. The same year also saw user cum troop trials for Pinaka, the multi-barrel rocket system.

During 90's Army focused on indigenous efforts like overhauling local production of spares and local upgrades. The 155mm ammunition was manufactured, BMP infantry fighting vehicles overhauled and Vijayanta tanks upgraded. Yet, development and deployment of new indigenous equipment was slow. Arjun MBT, Nishant RPV (remotely piloted vehicle) and pinaka MBRLS (multi-barrel rocket launching systems) are some such equipment. Successes include local overhaul of SA-6 missile systems and ZSU-23 –4 Shilka Anti-aircraft systems It is also standardising around 155mm 52-calibre guns except for mountain division and paras who will use the lighter 105mm guns.

Analysts argue that though all arms have gone though two and half modernisation cycles since independence, equipment modernisation alone is not sufficient. Modernisation of Indian army gives rise to paradoxes of time and meaning. Modernisation depends a lot on ability of field commanders to accept organisational, doctrinal and equipment changes as also finer perception on the strategic issues involved. For Indian army, the test would be an ability to mix individual assets into combined arms and logistics team of high combat worth. Technology is the narrow area which modernisation debates generally centre around. But equipment may just remain well –

produced ironmongery, but when they are synthesised in a complimentary mix they come to life.[15] Overall, Indian army is adequately armed, though there remains areas where improvements or modernisation is pending. That does not weaken the overall dissuasive quality of the force.

3.2.4 Precision engagement capabilities:

Apart from the artillery, the greatest thrust in precision guided munitions in the new RMA has been on missiles. India, despite all the odds, continued with the Integrated Guided Missile Development Programme.

It was plagued by a number of delays, due to fund problems and technology denial regimes. But through a slow yet determined process of trial and error method, India managed to develop precision guided weaponry. A crucial component of the new RMA, the missile programme is aimed at carrying conventional and nuclear warheads from land, sea or air-based platforms. They are meant for stand-off precision strikes, a key feature of RMA.

But while they have been successfully testified, complete induction into the armed forces and large-scale production is yet to happen. Also, India's ultimate aim in this field, an inter-continental ballistic missile (ICBM) 'Surya' is yet to take full shape.

The Agni I surface to surface missile with a range of over 1,200 kms was test flown in 1989, 1992 and '99. There have been five Agni tests, three under Agni I and two under Agni II. The Agni technology demonstrator of May 22, 1989 heralded the project. The experimental flight of May 29, 1993 was a partial success. In February 19, 1999, an increased range of 1200 kms was test-flown, thus winding up the first generation under Agni I.[16] The end of the decade saw the test firing of Agni II, which has a range of 2000 kms covered in 648 seconds.[17] There was however a gap of 5 years (1994-99) between Agni I and first Agni II, a period in which Pakistan has also developed its Hatf series of missiles. . Agni II is an intermediate range ballistic missile (IRBM). It is solid fuelled and

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[15] Shankar Bhaduri: *The Indian Army* New Delhi: Lancer, 1990, pp 115-116

16. John Cherian *'The Agni Test and After*, Chennai: Frontline, February 16, 2001, pp 41-42

17 L Subramaniam *'Behind the Success'* Chennai: Frontline, 16 2001, p 43

can be stockpiled in large numbers. The missile can have a land based nuclear warhead. It can also provide air-based deterrent aboard aircraft SU30s and mirage -2000s.

Other missiles enhancing Indian precision engagement capabilities include Prithvi, Trishool, Akash and Nag. Prithvi is a surface to surface missile with 40-250 kms range. It is comparable in propulsion range to the US scud missile.

Trishool is a surface to air missile (SAM) of 500m to 9 km range. It is basically an anti-aircraft and anti-helicopter missile; also ship-launchable, under the army's air defence wing. Akash, another SAM has a range of 30 kms, is tracked-vehicle mountable and was test flown in August 14,1990. Nag is an anti-tank missile with 4 kms range first test flown in Feb 7,1990. It is part of efforts that started in the 1960s.

Since the large-scale induction of these munitions is slow, army continues to use guided missiles purchased from abroad, mainly Russia and CARs. Army's anti-tank guided weapons included Entac Milan (man portable anti-tank guided weapon), Sagger, Snapper and Swatter missiles. Army's air defence weapons included the SAMs -Tiger Cat, SA-3, SA-7, SA-8, SA-11 and SA - 13.[18]

While India has tested the 2,500 km range solid Agni-2 mobile missile, it continued to deploy and test land and sea- launched versions of the tactical Prithvi missile, and pursued its submarine launched cruise and ballistic missile options . Army has some three to five surface to surface missile launchers and 1615 light surface to air missile launchers. Work on intercontinental ballistic missile 'Surya' with a range of 5000 kms is at an advanced stage, based on PSLV and ASLV (Augmented satellite launch vehicle launcher) launch systems.

3.2.5 Mechanisation of forces:

The infantryman with high-tech automatic weapons, geo-positioning systems and individual communication that links him directly to the theatre commander is what RMA visionaries would want for the army. But India has not been very impressive when it comes to mechanising its forces. The infantry is largely using pre-WWII weapons like light machine guns and radio communication systems.

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[18] *'Agni Testfired'* New Delhi: Times of India, May 22, 1989

But during the 1990s, army had chalked out broad plans to re-equip the infantry for the future. In fact, the army faces the dilemma of choosing between reduced manpower to create a more sophisticated and mobile force and the need for large manpower in low intensity conflicts. For a large army, modernisation will be slow.

India's infantryman carries light automatic weapons, rifle /machine gun, grenades and rockets. An ambitious programme of induction of new generation individual and platoon weapons is underway. [19] Between 1990 and '99 there were four rapid (partially mechanised) and three armoured infantry divisions, up from one mechanised and two armoured divisions. Battalions have support weapons and machine guns, mortars and anti-tank guns. The mechanised infantry has light armour-plated tank-like vehicles and heavy weapons such as cannons and heavy machine guns.

Some of the best-mechanised forces are in the western and mountain sectors. In the western sector, mechanised troops comprise of mobile balanced groupings of high-striking power. They are high value capital-intensive combat groups with cutting edge weaponry. They use T-72, BMP infantry combat vehicle, F++-77/B-02 medium guns, other field pieces which are indigenously developed and designed, self propelled air-defence missile and gun systems, 'Black' electronic warfare array and assault bridging for dry and wet crossings all found together in supportive mixes.[20] Mountain corps comprise of light infantry artillery, engineers, signals, helicopters and animals, all emphasising a combined arms approach. The most visible manifestation of modernisation in equipment is in Siachen, where army simply cannot function without such assets.

3.2.6 Use of IT capabilities:

For the army, information technology is being introduced in three main areas of training and curricula; simulation of wargames; and in communication equipment. In late 90's army realised that IT is the future of warfare.

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[19] Timoty Hoyt n 4 p 19

[20] Shankar Bhaduri, n 15, p 117

The army undertook a vision statement to establish a strong information technology infrastructure to act as a force multiplier by incorporating fully automated and networked operational and management information system, complemented by a fully information technology literate manpower. Army In the mid-1990s revised the Army plan 2000, a document developed in 80s. Efforts were made to incorporate changes for a cyber war capability.

But army is also aware of the challenges it will face. Imparting computer training for a force largely drawn from rural areas is a tough task. Army's IT Roadmap 2000 spelt out objectives and action plan for training IT in the force. The aim was to make its entire officers and junior leaders computer literate by 2002. Army Institute of Information technology in Hyderabad was established to teach IT warfare. Three Army Technology Institutes (two at Secundrabad and one in Pune) have introduced IT in training. There are plans for 25 more such schools. National Defence Academy and Indian Military Academy have incorporated IT in their curricula. A Junior Leaders' Academy has been set up at Bareilly to upgrade the skills of junior officers.

In the 1990's, army's sophisticated communication projects ASCON and AREN were moving towards realisation (see separate section in chapter 4).

Efforts have been on to reduce the cost of wargames by simulating them on computers. The help of private firms was taken by army to design realistic wargames to suit its needs. It is a great cost-cutting measure, as real wargames and exercises involve huge expenses and logistics. The army training command developed two computer assisted war game packages CDR-1 and CDR-2. The first battalion level wargame was developed in 1996, lessons from which were incorporated at the brigade division and corps levels.[21]

3.2.7 Logistics capabilities:

A key area of interest in the RMA debate has been the need for integrated logistics, increased airlift capabilities and proper co-ordination between fighting

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[21] Afsir Karim (ed) *The Indian Armed Forces - A Basic Guide,* New Delhi, Lancer, 1995 p 25-33

formations and the logistics wing. Indian armed forces operate in some of the most inhospitable and diverse terrains. Its borders vary from plains, deserts marshlands and mountains. This necessitates an approach that differs according to the given topography. It will not be possible to have engineering and transport vehicles in mountainous terrain, in which armed forces will have to make use of animals. India has some impressive sealift and airlift capabilities. But often the argument goes that if the forces are modernised, their logistical backup will increase, putting further burden both in terms of equipment and expenses. The more modern and sophisticated a field force, the logistic backup rises exponentially to maintain it in reasonable shape. When a 50 ton tank replaces a 40 ton, probably the logistic support goes up some 2.5 times.[22]

The service corps, engineers, Signals and ordnance corps carry out Indian army's logistics. Given the rough terrain in which most of army's operations are carried out, it is necessary to use animal transport in mountains. They also have capabilities to dispatch supplies from air through parachutes. Service crops have been organised into transport fleets, animal transport companies, airdrop facilities and field supplies. The transport fleets have heavy and light trucks and lorries to carry supplies, stores and ammunition forward. Animal transport carry supplies, stores and ammunition in areas where vehicle cannot ply.[23]

But generally, the equipment used are Second World War vintage. The army uses radio sets with low, medium or high power. Radio relay is used as standby to line (telephone) communication, apart from teleprinters and telegraph. The use of optical fibres and satellite communication is yet to take full shape in the logistical arm of the forces.

3.2.8 Asymmetric warfare capabilities:

As mentioned earlier, the army has not been fighting conventional war in most of the nineties, but was engaged in Asymetrix warfare viz., low intensity conflicts, counter-

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[22] Shankar Bhaduri n 15 pp 117-118

[23] Afsir Karim 1995 p 34

insurgency (COIN) operations and proxy war. A different set of methods and tools were required for success in this form of warfare. An important area was the formation of a network, a break from the army's hierarchical structure. The network would include paramilitary forces, police and civil administrators as well as government officials. A proper command structure had to be created, with each wing having its own set of goals and roles. The strictly military role had to be tempered with the psychological operations, aimed at winning the hearts and minds of the alienated populations.

Army's network centric capabilities are best exemplified in its counter insurgency operations. The first such attempt was a Unified Command in Jammu and Kashmir, formed in 1993. It had a mixed performance, but for a state torn between militant groups, the efforts at regaining peace were commendable. The failures of Kashmir Unified Command largely came from the personality clashes and lack of coordination between the various agencies that comprised it.[24]

In 1997 January 20, a Unified command was formed for Northeast bringing together army, police and paramilitary with the aim of optimum use of all force and improvement in their co-ordination. It was a networking of army, paramilitary forces, Assam Rifles, the Border security force and police units. It has a three-tier structure consisting of a strategy group headed by chief secretary. The Unified Headquarters in Tejpur, controls all COINT operations.[25]

Post-Kargil, a 'Kay Force' was raised in Kashmir, to manage COINT operations. The formation is responsible for the 65,000-sq. kms of difficult terrain in most of North and central Kashmir. Its functions include COINT operations and civil affairs operations

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[24] Bhashyam Kasturi *Unified Command HQ in Counter Insurgency and Role of Intelligecne in J& K,* New Delhi: Indian Defecne Review Vol 16 (1), Jan-March 2001 p 53-55

[25] Ashok Krishna *India's Armed Forces: 50 Years of War and Peace,* New Delhi: Lancer, 1998, p 161

aimed at winning the hearts and minds of a hostile population. It seeks to pursue militants in 'wet hen mode' giving them no time to rest and recuperate. Realising that the elimination of leadership is a way to success, the Kay force killed top leaders of major Tanseems (terrorist camps).[26]

A special mix of skills, equipment and modes of warfare is needed to face the asymmetric threats, especially guerrilla warfare and anti-insurgency operations. In the Indian context, Special forces are best suited to handle such threats. But India's Special Forces remain limited in number. They include 57 mountain division, National Security Group, Special Protection Group, Special Action Group, Commandos and Indian marine special force. Very little is made public about these groups but they are supposedly trained in guerrilla and anti-guerrilla operations. Their functions include sabotage, counter-terror operation, all terrain fight, demolition, path finding, psychological operations (psyops), intelligence gathering and COINT operations. They are also used in air-borne insertion and extraction.

The special Action Group is primarily an anti-terrorist group, backed by National Security Group. The estimated operational strength of India' Special forces is between 12,000 and 15,000 troops.[27] Army has added a counter insurgency division. Army's Special Operations Force on active duty is estimated to number around 9000. Believed to compromise of 3 brigades, they are a specialized counter insurgency division. They were deployed in IPKF of Sri Lanka as also in the Northeast. These forces can operate in tropical rain forests as also mountainous terrain. They also contain civil affairs forces and have psychological operation capabilities.

The Special Forces are supposedly equipped with high-tech weapons. The Special Forces are provided with parachutes as also expendable anti-tank weapons. They use mortars and built trap grenades. The trial for modern light all terrain vehicles (LATV) has been carried out for special forces. But the failure to increase Special Forces to a corps

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[26] Tonk S S *Counter-insurgency Force (K)* Sainik Samachar, New Delhi March 2000

[27] S P Baranwal, n 9, pp 228-231

level formation is a serious drawback. The importance of Special forces as the first to go to battle and the army's requirements of rapid response and possibility of low Intensity conflicts were not often taken into account in addressing this problems.

3.2.9 Interoperability and jointness

Joint operations, a key feature of RMA, means developing capabilities to conduct a joint and integrated battle, through co-ordination of the three services of the armed forces and paramilitary if necessary. The future battlefield with high-tech weapons and support systems would be best exploited through joint and integrated operations. But in India, army, air force and Navy had been following their own single service doctrines. The differences of perspective and service legacies are reflected in the doctrines both on strategy and tactics thus affecting the application of force in synergised manner. [28]

While the IPKF quagmire was blamed mainly on the lack of co-ordination between the naval and ground forces, Kargil victory was largely attributed to the joint air-land battle, in which the IAF co-ordinated its strikes with heavy artillery fire from the army. Operation Safed Sagar was studied as a successful example of joint operations. But unlike the US attempts at creating Joint Commands, the specific security threats of India seem not to warrant a tri-service jointness. For example, in the mountainous terrain in which a large amount of Indian army's operations are concentrated, there is little the Navy could do. But a joint command is created in Anadaman, which necessitates, and facilitates such a formation, given its importance as a potential nuclear command.

But in overall analysis, while air borne element is vital for army for rapid and flexible responses, army aviation is not well equipped. Light helicopters like Cheetah and Chetak cannot completely fulfil the requirement for immediate close air support.

In early'90s, India had over 20 air defence regiments, with anti-aircraft guns, self propelled) guns and surface-to-air missiles, while shoulder-fired missiles were still under evaluation. IAF's Chetak and Cheetah light helicopter were given for spotting, liaison and close air support duties. One Mi-2 gunship was on deputation. However, army in

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[28] Vinod Anand *Achieving Synergies in Defence*, New Delhi: Strategic Analysis, January 1999, Vol XXII, no 10, pp1497-1512

1999 was still hoping to induct indigenous advanced light helicopter for (ALH) its three aviation corps and light attack helicopters for COINT operations. The prospects of getting ALH in the near future are still bleak.

Army Aviation Corps (AAC) has a force of over 300+ rotary craft in 14 helicopter units consisting of the HAL Cheetah (Alouette III) and ex-Indian Air Force HAL Chetak (Alouette II). The role of the Corps has become important as it helps locate the enemy and assists the ground forces, by helping the troops on the Siachen Glacier, by air dropping supplies for them above 20,000 feet.

Throughout the 90s the existing maintenance, operations and modernisation efforts of the army were badly affected, exercises put off, tanks and other equipment put in storage, leading to a decline in readiness levels. Army focused on indigenous overhauling, local spare production and upgrading. Thus 155-mm ammunition was manufactured, BMP vehicle overhauled and 'Vijayanta' tanks upgraded. Development and deployment of new indigenous equipment was going at slow pace. There continues to be issues with Arjun MBT, Nishant Remotely Piloted Vehicle, and Pinaka Multi Barrel Rocket Launcher. Success stories include local overhaul of SA–6 missile systems and ZSU – 23- 4 Silka AA System.

Despite all this, analysts argue that with 60,000 officers, over one million men and an inventory of Rs 500 trillion, Indian Army is still not equipped to fight a modern war, even insurgency and terrorism in the high technology security environment. Regrettably India is many years behind in modernisation and perhaps a generation behind in information technology.[29] While one would wonder if India could afford 35-division army, she is compelled to hold defensive position physically along an arduous terrain in the borders. Its over 15 years long counter – insurgency commitment Jammu and Kashmir and Northeast also limits choices of right sizing.

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[29] . Ashok Krishna, n 25, p 161

3.3 NAVY

Navy is the versatile and flexible instrument of the nation state, used to impose influence, apply coercion or indicate support when needed. It is therefore essential to maintain a force capable of surveillance, real-time connectivity and put in place the system-of-systems with platforms consisting of high-tech weapons, sensors. Warships are not mere weapon platforms, but can act as command, sensor and weapon systems integrating with other forces to provide a versatile package of capabilities. Both Arun Singh committee and 10th Finance Commission have recommended allocation of funds to maintain a forceful presence on the country's largest and least defended border — sea, and increase of naval budget to 22 percent of total defence budget by 2000 and 30 percent by 2005.[30]

3.3.1 Manpower and distribution:

Navy is believed to have 53,000 sailors and marines and 5000 men in naval air wing. Under the Naval headquarters New Delhi, the navy has three commands: Western, eastern and southern with headquarters in Bombay, Vishakhapatanam and Cochin. Western and Eastern wings comprise of warships, submarines, air craft carriers and other support ships. Southern command is responsible for all training activities.

The Coast Guard looks after the preservation and protection of India's exclusive economic zone (EEZ) measuring over 2.002 mn sq kms. It conducts surveillance to prevent poaching, piracy and smuggling in the EEZ as well as check pollution, search and

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[30] . The discussion on Navy is based mainly on the following sources: Annual Report 1999-2000, New Delhi: Ministry of Defence, pp 28-46, John Cheriyan '*A Thrust to Sea Power*', Chennai: Frontline, 30May 12, 2000 pp 130-131, Madhusoodanan '*Brahmaputra Joins Western Naval Command*' New Delhi: Sainik Samachar Vol. 47, No. 16, 16-31 August 2000; Mritynjoy Mazumdar '*Navy's Procurement and Modernisation programmes*' New Delhi: Bharat Rakshak Monitor, Volume 3(1) July-August 2000 at www.bharat-rakshak.com/MONITOR/issue3-1/mazumdar.html ; Rahul Roy-Chaudhury *Sea power and Indian Security* London: Brassey's, 1995; Raja Menon and R K Dhawan: *The Indian Navy*, New Delhi: Naval Headquarters, 2001

rescue and protection of marine environment. Under the National Development Plan 1992-97, CG was supposed to get 30 ships and 30 aircraft, but so far it has got only 9 ships and 13 air craft. Under the Coast Guard Development plan 1997-2002, coast Guard is expected to acquire pollution control vessel, hover craft, indigenous A2 H and medium range surveillance aircraft (MRSA). As of now, CG has a total of 34 ships, 15 interceptor boats / crafts and 32 aircraft. This is inadequate, given the vast area it is tasked to monitor.

3.3.2 Platforms:

While some argue that the navy has sufficient forces to assert sea control in a short conflict with Pakistan, it has often been described as 'insignificant' 'Cinderella' force by others. Till 1962, navy was seen as defensive force with Pakistan as the only perceived threat. But after 1962 war with China, a more rational force structure with 138 ships was approved, consisting of two aircraft carriers, 30 destroyers/ fighters, 16 submarine and 90-mission support vehicles. By 1995, force levels were at 152, an impressive increase from 33 of 1964. Many of Navy's acquisitions happened in 1980s including the lease of Soviet Charlie– I class submarine, purchase of former HMS Hermes, renamed "Viraat" and fleet expansion from 32 principle combat ships to 44.But there was a fall between 1986 – 96 as modernisation in the navy is completely budget – driven. In 90's the carrier fleet became just one, with the decommissioning of Vikrant and the number of fighters and destroyers has declined to. 20. Indigenous ship building programmes were plagued by long delays and technological snags The revitalisation and restoration started after 1996.

In the nineties, Navy consciously undertook the difficult task of indiginisation in consonance with the national endeavour towards self-reliance. It included both indigenous construction of ships and development of major sonar systems, sensors and weapon systems with the help of DRDO and defence PSUs. In the late 90's India achieved some landmarks which helped the process of change from a 'buyer's navy' to a 'builder's navy', through commissioning of indigenously, built destroyers INS Delhi (November 1997) and INS Mysore (June 1999).

The Navy has 16 Submarines, 26 Principal surface combatants, 38 patrol / coasted craft, 7 mine warfare vessels and 1,200 marines. There is only one aircraft carrier, and 8 guided missile destroyers. India is yet to acquire or develop Submarine of the SLBN, SSN, SSG varieties. The 16 submarines we have are of the SSK/SS varieties, mostly of foreign origin.

Many of the warships have Indian designs and have been constructed in Indian shipyards, while others largely employ Russian or French design and technology. India's ships are examples of joint design and production, often incorporating technologies from abroad with indigenous designs. India is capable of building and overhauling ships, But in 90's the navy faced the twin challenges of greater responsibilities and shrinking assets and resources while India had the difficult choice between amounting greater influence in the Indian Ocean region, of suffering from obscure ships. In other words, while India had capabilities for local construction, efforts at indigination were dogged by delays, labour issues, equipment shortage as well as financial troubles.

At the end of the decade under review, Kargil conflict helped in better availability of funds for some long-delayed projects. They included construction of an aircraft carrier, modification of the Russian Admiral Groshkov aircraft carrier, refit and upgrading of the INS Viraat, as also procurement of destroyers, freighters, corvettes, Submarines and induction of new missiles. The INS Viraat, India's lone aircraft carrier, is undergoing refit. In 1997, Viraat was docked for an 18 – 24 month refit at Naval dockyard, Mumbai, at a cost of over USD 70mn. Its planned C4I enhancement includes new electronic warfare systems, long – range surveillance radars and advanced computer packages for secure communication system. India needs at least two carriers for simultaneous control of Arabian Sea and Bay of Bengal. But after decommissioning of INS Vikrant and Viraat on the docks, navy is now practically without a carrier. India has plans to construct a medium sized carrier.

The acquisition of Admiral Gorshkov, the 44,500-Ton Russian carrier was initiated in March 1999. But there is strong debate in Naval circles as to the need and feasibility of this huge contract with the Russians, for an ageing aircraft carrier. The cost

of repairs and modification for the ship would exceed USD 500mn. It will have 21 Mig – 29 K fighters and 13 helicopters, as the Russians insisted as part of the contract. It must be remembered that the runway of Gorshkov, according to some experts is not sufficient for MiG 29 Ks and also that these aircraft were never inducted into Russian forces. The Admiral's modernisation programme includes anti – air, anti – submarine and electronic warfare capabilities. EW packages would include top of the – line, ECM (electronic countermeasure) resistant communications, purchased with ECCM capabilities. Kamov Ka – 31 airborne early warning helicopter and Ka-28 anti – submarine helicopter will be added. Virat's Sea Harrier fighters and Sea King helicopters can operate from this vessel also.

In June 1999 Indian government cleared the long – delayed ADS (Air Defence Ship) project, expected to replace the INS Vikrant. The air defence ship will cost over Rs. 20 cr, and will be constructed Kochi Shipped. Naval Design Organisation had given a proposal for a 17,000-Ton light carrier in 1997. When completed, it is expected to be 250- mtre long, ski – jump flight deck equipped ship with 32,000 tons displacement and a crew of 1350 personnel. The project 15 Delhi class destroyers consist of three large, general-purpose destroyers with a hybrid mix of Russian, western and western-derived Indian technology. They are the largest warships built in India so far, at Mazagon dockyards, Mumbai. It has got design features of Kashin, Godawari and Sovremenny and is a result of co – operation between Russian Severnoye Design Bureau and Directorate of Naval Design. But its construction took over a decade to finish, due to equipment supply delays from Russia; before INS Delhi and INS Mysore finally moved in service in 1997 and 1999. INS Bombay will soon join service.

These destroyers can function in NBC environment. They have heavy missile component. These warships will use anti – submarine weapons like PTA 533 torpedo tubes, twin RBU – 6000 12 tube rocket launchers. They carry two Sea King MK42B ASW/ASH helicopters, giving long – range surface strike capacity of around 400 Kms. For information warfare, these ships are fitted with indigenous and Russian radars, like the MR – 775 M2, which provide tracking data for the SA- N – 17 missiles as also Bharat/ Signaal RAWL / P318Z (LW08) D- Band Air – Surface radar. Sonar suites have

been built locally called 'Bharat APSOH ' and 'HUMVAAD'. Electronic warfare capabilities include Bharat Ajanta EW suite and two Russian PK – 2 Decoy launchers. The Bharat Shikari Combat data system is based on an Italian design.

Another ambitious plan is the project 17 frigate, for standard large combatants with 12 units. The cabinet approved the project in 1997. The Navy placed an order for three units in early 1999. But the plan seems to be slipping behind schedule. It is planned to consist of multipurpose ships with area defence capabilities and displacement of between 4600 and 5000 tons.

The project 1135.6 Frigate is planned to replace the aging Leander class frigates. The plan is for three ships – Talwar, Trishul and Toofan. The work of Talwar was almost completed by 1999. The keel for Trishul was laid down at St. Petersburg in 1999. Work is in progress for Toofan. The naval variant of Prithvi SSM would be carried on these ships.

INS Brahmaputra contains three variants of the project 16 Godavari class, and are in various stages of sea trials. Its work was delayed by labour unrest in GRSE Calcutta, equipment shortage and funding troubles. The ship contains Indian, Russian and western weapons and equipment. INS Brahmaputhra was commissioned in 2000. Since Trishul SAM is not being integrated, it will have to use either Russian SAMs or Israeli Barak missiles. The INS Betwa, belonging to the same class was launched in February 1998.

Project 25 A Kora Class corvettes were ordered in late 1980s to Garden Reach Shipyard, Calcutta. The first of them, Kora P-61 was commissioned in August 1998. Three other ships Kirch, Kulish and Karmukh are at various stages of sea trials since Mid 1999. This project is valued at around USD 200 mn.. However, these corvettes lack any significant air defence or anti-submarine warfare systems. INS Kora has two manually aimed launchers for the SA-N-5 Igla short-range anti-aircraft missile. The sensor suite is largely of Russian origin, consisting of MR-352 pozitiv-E air search radar, a MR-123 vympel FC radar for the AK-176 gun and two AK-630 mm CIWS. Russian sensors and fire control systems are integrated to Bharath Vympal Combat Data system. Kora class has 70 percent indigenous component.

The ships commissioned in 1998 – 99 alone include INS Kora, the first of four missile corvettes, constructed locally at GRSE, Calcutta, NNFAC, and INS Mysore, second in the Delhi Class of destroyers. The first indigenous fleet tanker Aditya and Brahmaputhra class frigates are at final stages of construction.

3.3.3 Asymmetric warfare capabilities:

The misconception that the Navy is of no use in low intensity conflict should be removed. The navy is involved in LIC, off West Coast, Pak Bay and Andaman Seas. In the West Coast, lining Gujarat and Maharastra naval patrolling was tightened especially after Mumbai serial blasts of 1993. The explosives and arms used in the blasts were in fact smuggled to the West Coast by sea; thus revealing that maritime medium is permissible to terrorism and subversion. A good percentage of seizures by Coast Guard's patrol vessels include contraband, illegal arms, ammunitions and explosives, posing grave threat to national security. [31] Indian navy and Coast Guard have been doing joint coastal patrolling and surveillance operations since 1993. In the Tamil Nadu coast, Pak Bay security environment is unstable. Smuggling of contraband and transportation of personal across borders have been noticed. Navy is now engaged in the joint patrolling and surveillance by sea. Andaman is vulnerable due to its proximity to arms and drug trade regions. Navy had reported arms shipments and gun running in Adman Sea and many a time intercepted offending crafts. There appears easy availability of arms and explosives in the region.

3.3.4 Joint operations:

Jointness and interoperability is a major area of deficiency. Navy lacks sufficient air cover, particularly early warning – and would be at risk in operations too close to the Pakistan Coast. Lack of adequate reconnaissance aircraft, poor sensors and insufficient standoff missiles are other problems.

Naval aviation has 5,000 personnel and 37 combat aircraft; but no bombers. It has 26 FGA; and. 50 MR / MPA. Navy has 72-armed helicopters and 70 aerial

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[31] Raja Menon, n 30, p 17

surveillance and warning helicopter numbering around 6, but there are no mine warfare helicopters.

3.3.5 Use of IT capabilities:

Navy has imbibed the fallout of RMA. IT policy for hardware and software standardisation has already been promulgated. The service is harnessing the fallout of IT revolution; by initiating upgrade of system hardware, as also by purchasing off – the shelf equipment. As the cost of conventional arms and forces increases, even great powers are unable to maintain large conventional forces. The aim of Navy is to give thrust on deterrent forces and right sizin. The force–structure should include technology – based force multipliers; thus increasing capabilities with reduced numbers.

The long–standing philosophy of Navy has been self–reliance through indigenisation and power through technology. Navy should also exploit potential of 4th dimension, through space – based systems as also develop and maintain a rapid response force for sea – lift capabilities.

Many analysts have recommended the following force level for Navy by 2015: Two carrier battle groups with 20–25 vessels, displacing 400 ton and above and, 20 submarines. The support force should include 30 patrol vessels of 200 to 300 tons, apart from tankers, minesweepers, amphibious vessels and rescue craft. The aviation inventory should include helicopters, fighters and medium range patrol aircraft. While planning the number of submarines, extra regional powers with interventionist ambitions will have to be kept in mind.

India is fast chasing the dream of becoming a complete "builders Navy" with the series construction of ships: destroyers, frigates and submarines. The continuing series production is expected to balance natural attrition due to obsolescence of platforms.

3.4 AIR FORCE

Till 1990 IAF remained a largely tactical force. Today it comprises around 40 combat squadrons of air defence, strike, close support and specialist aircraft and 10 squadrons of heavy and medium transport aircraft and a few light, utility aircraft and 20 helicopter units. But a fighter aircraft of its own the Light Combat Aircraft (LCA) remains an unproved entity.

In the ongoing modernisation plans, the largest sum goes to IAF, which plans to have new combat air craft, air – borne warning and control systems (AWACS) and missiles. India is co– operating with Russia in a fighter aircraft and an upgraded transport plane. India is keen to buy Russian air defence systems as well with persisting reports that India aims to deploy ABMs on its own, based upon Russians–300VM system. India is also developing military co–operation with Israel, especially in fields like unmanned reconnaissance aircraft and air – launched munitions.

During the late 90's IAF emerged as the strategic service and the only arm of India's Nuclear deterrent. In 1997, it formulated India's first Air Power Doctrine; (APD) a result of close study of the Gulf War and the emerging RMA. APD's fundamental issues were the need to accord offensive air operation the same priority as defence, reduction in force levels, acquisitions of more force – multipliers and improvement in Command, Control, Communication, Computers and Intelligence (C4I) structures as well as revamping and modernisation of air defence and communication network. These were APD – 97's macro map to modernisation, aimed at providing deterrent to both PAF and PLAAF.[32]

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[32] R Chattopadhay *'The Indian Air Force: Flying into the 21st Century'* New Delhi: Bharat Rakshak Monitor Volume 3(1) July-August 2000 at www.bharat-rakshak.com/MONITOR/issue3-1/ins.html

3.4.1 Manpower and distribution:

While the quality of pilots is quiet high, their numbers are seen to be declining and the funds allocated for operation and maintenance is minimal. As of 2000, IAF had 150,000 active manpower.

The IAF is organised on functional as well as geographical basis; with five operational commands: Western, South-western, Central, Eastern and Southern. Maintenance command and training command are the functional arms of IAF.

The operational commands control some 45 fixed wing squadrons, 20 helicopter units and numerous surface – to – air missile squadrons with unit establishment varying from 12 to 18 aircraft. The total aircraft strength is estimated at 1700 making it the fourth largest airforce in the world. The IAF, as of 1999 had 500 pilots; way short of its authorised strength of 3347.

3.4.2 Platforms:

Economic difficulties of the early 1990s and collapse of USSR pushed IAF modernisation back by at least half a decade. Availability of spares and equipment support affected operations between 1991-1994. The serviceability of flight, especially MIG – 29 and An–32 was particularly hard – hit, at a low of 60% to 55%. Total annual flying hours declined from 256, 200 hours in 1991-92 to 239,000 hours in 1993-94.The yet–to–be inducted advanced jet trainer (AJT) and Light Combat Aircraft (LCA); ageing equipment, especially the obsolete MIG – 21; and rigorous flight schedule have led to high rate of accidents. Efforts to procedure AJT have been stalled over a decade. India's fixed wing air craft is totally out of comparison (37 for Navy and 774 for air force) with that of China (507 for Navy and 300 for Air Force). But in rotatory wing air craft, Indian navy has 72 and IAF has 34 while Chinese Navy has 37 and PLAAF has none, probably because helicopters were phased out long ago.[33]

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[33] Anthony H Cordesman: *The Conventional Military Balance in South Asia: An Analytic Review*, Washington D C: Centre for Strategic and International Studies, Feb 27, 2000 p 6 available at www.csis.org/burke/mb/asia_sa_mb_conv_mb.pdf

Indian airforce is estimated to have 774 combat aircraft which includes no bombers. The fighter attack aircraft is estimated to number around 367 and there are 368 fighter interceptor aircraft. Recce and fighter ground attack Recce aircraft number around 16. But there are no COINT aircraft or operational conversion unit (OCU).

While four aircraft are for maritime reconnaissance and maritime patrol, India is yet to have air borne early warning (AEW/AWACS) aircraft. The largest fleet after combat aircraft is transport aircraft numbering 336, while tanker aircraft, a force multiplier, are a mere six. Total number of helicopters is 165. The number of armed helicopter, from Navy, army, and air force is a paltry 34.

A look at India's aircraft in active service reveals majority of them is of foreign origin and were purchased or license – produced for many years, long after their technology had become obsolete. As of 1999, there is one T–60, two T–4, 23 Sea Harriers 35 Mirage, 88 Jaguar S, 8 S4 – 30 Mks, 64 Mig – 29s, 147 MIG–27s, 79 MIG– 23s and 304 MIG–21s. This list makes it clear that MiGs constitute the largest in the fleet. The fighter force comprises of Hunters, Ajeets (Old generation), MIG 21s, MIG – 23s, MiG 25s, MiG 27 and Jaguar (New Generation). MiG – 29s and Mirage – 2000 are air defence aircraft. Canberra, an aging light bomber, is used in ancillary roles. In the rotary wing section, there are 14 KA – 28s, 7 Ka 25s, 25 Sea Kings and 26 Chetaks. IAF has ordered 17 two –sector Jaguars in 1999, which are under production a part from the Mirage 2000s and SU- 30s.[34]

Chetak and Cheetah helicopters manufactured by Hindustan Aeronautic Limited (HAL) are used as air bone forward air controller (FAC) anti – tank Guided Missile (ATGM) carriers and for search and rescue operations. HPT – 32, manufactured by HAL is used as the basic trainer aircraft. This is grossly inadequate, as they are subsonic trainers. India requires super-sonic trainer, as much of its aircraft is aircraft is supersonic.

One reason for the large number of MiG crashes is that pilots trained in the subsonic trainer aircraft are straight given to fly supersonic MiGs, leading to human

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[34] Vijay Seth *The Flying Machines*, New Delhi: Seth Communications, 2000, p 10-11

errors and accident. The AJTs were supposed to be bought, to bridge this gap. But for a large part of the 1990s, the IAF could not even decide which model to buy. At the applied stage of training, HJT16 (Kiran) and Iskara acquired from Poland are being used. HS–748 is used as transport aircraft trainer. MI – 17 and Chetak are used in high–attitude operation; as also to provide logistics support to ground forces.

MIG – 21s, numbering over 300, are the backbone of IAF'S air defence fleet, with around 16 operational squadrons. In the nineties the older MiG – 21 Sub–type were being retired, though MIG – 21 and MIG – 21 BIs continued to be main aircraft, doing routine alerts along border and reconnaissance missions. They lack the advanced capabilities like sensor abilities and beyond visual range (BVR) capabilities, but there were so many in number, making it extremely difficult to have a complete phase out. MIG – 21 / FL/Ms are over 25 years old; while the oldest of MIG – 21 Bis are 18 years old. A comprehensive upgrade of MiG – 21 was repeatedly postponed till mid 90s due to lack of funds, spares or upgrade packages. The upgrading of MIG – 21s with Russian assistance is 4 years behind schedule. Yet, India continues to rely on MIG – 21 airframes; losing aircraft in accidents at an annual rate of 20 –25 planes.

Towards late 90's an upgrade of 125 MiG – 21 Bis started. It was supposed to finish around 1998, but couldn't, as re–design problems like the altered centre of gravity delayed it. The first 36 upgrade kits from Russia were obtained in 1999. The plan was to upgrade MiG – 21s with new avionics, light weight super Kopyo multi–mode radar and a self– defence suite. The upgrades are expected to make these aircraft able to deploy wide range of air–to–air and air–to-surface weapons.

Despite their accident rates, MIG – 21s will remain in service till the proposed replacement – Light Combat Aircraft enters service. Though LCA is rolled out, running 10 years behind initial plans, it is yet to be fully inducted in the airforce. There are efforts to make MiGs BVR capable. MIG – 23 MF will remain as a BVR training unit. Both the second–generation BVR types –MIG–29 and Mirage 2000- are being upgraded with modern sensors. All of MIG – 29 fleet is expected to have their N–109 radar by electronically scanned systems. MIG – 29 is made air-to–air refueling capable to increase

its endurance. Both squadrons of Mirage 2000s have been planned to undergo avionics upgrade. After the Kargil operation Safed Sagar, in which Mirage 2000s BVR flight performed well, IAF is considering the purchase of 10 more Mirage 2000 Ds. India had also given an order for 50 Su–30 MKIs from Russia in one of the biggest defence deals ever. Already 18 Su-30 MKIs are in service with No 24 Squadron.

Air marshal K.C Cariappa's wish list wants the following force mix:

- Fighter aircraft: Three squadrons of SU – 30, two squadrons of Mirage 2000, three / four squadrons of MiG – 29, ten squadrons of updated MiG Bis, three squadrons of updated MiG 27 and five squadrons of LCA.

- Transport aircraft: Around 24 Il 76 aircraft, 60 An- 32 aircraft and 30 Dernier aircraft.

- Helicopter: Four M:6, Six squadrons of Mi – 7, Six squadrons of ALW, and at least eight squadrons of Cheetah . Speed up the process of "Shedding the fat, said Cariappa, with plans for at least 203 aircraft. He recommended discussion with other services to get insights into how the future synchronized syncopated wars could be fought. [35]

The aim is to have a leaner, meaner force. If procurement and modernisation programmes follow the pace as of late 90's then by 2005, the total number of fighter squadrons will be down from 39 to 32. The planned retirement of MIG – 21 and MIG- 23 variants will reduce the number of types in service from 10 to 7. But most of the aircraft remain too useful to discard for IAF.

3.4.3 Weapons:

Indian Air force does not have the capability to launch major surface-to-air missiles. The 280–odd launchers can operate only with light surface-to-air missiles.

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[35] K C Cariappa *Sinews for Indian Air Force* Strategic Analysis Vol XXI No 9, December 1997, pp 1367-1381

Since early 1990s, the effort to stock precision guided munitions have begun. Precision guided munitions were used in Kargil offensive air operation, by Mirage 2000s, MIG – 27s and MIG – 23BiS. But in the Man-portable air defence system and SAM– rich environment, IAF lost one MIG – 27, one MIG 21 M and an attack helicopter.

IAF has successfully integrated western missiles with Soviet – designed aircraft. MIG-21s were retrofitted with a capacity to launch the Magic II AAM. MiG-29s have been adapted to carry the super– 53OD. By mid–1990s Soviet R–73 AAM missiles were integrated with French mirage 2000s used successfully in Kargil. Mirage 2000 can also deploy R –27 AAM as also the R–77, which is yet to enter service in large numbers.

The aim of upgrade and procurement programmes has been to install new radar, avionics, weapons-aiming system and electronics warfare suites. The new fighters, like SU–30 MKI and LCA are envisioned as multi-purpose.

3.4.4 Force multipliers:

IAF lacks in critical force multiplying capabilities like air borne early warning and control systems (AWACs), Mid – Flight refuelling, advanced electronics warfare and sophisticated night strike assets. India has begun using unmanned aerial vehicles (UAVs) only recently. There is little prospect of reducing the number of Airforce assets by introducing force-multipliers, with 200-300 SU 27s of the PLAAF deployed along the border. India's forward airfields in Ladakh, Jammu and Kashmir, Arunachal Pradesh and Assam need upgrade for regular operation by multi –role fighter aircraft. IAF still have to work into mid – life updating of its fleet, especially for MIG – 27, air-to– air-refueling capacity will be needed as the ability to attack the enemy in depth is essential which means modernising transport fleet. [36]

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[36] S P Tyagi and Sharat Dixit *An IAF for the Future: Some Considerations* , Strategic Analysis Vol XXI No 8, November 1997, pp 1199-1214 and December 1997 Vol XXI No 9 pp 1341-1354

In Kargil it was realised that India lost its air craft due to lack of electronics counter measures called Chaff / Flare dispensers. Only the MIG – 23BN, few Jaguars, and some MIG – 27s were fitted with automated countermeasures.

The MIG – 27 and MIG – 23BNs have electronic warfare capabilities. A comprehensive sensor and electronics warfare upgrade programme has been started for MIG – 27 and Jaguars.

The first in-flight refuelling was tested in Jaguars as late as 1996. IAF has placed orders for many IL–78 tankers for this purpose. It has also inducted UPAZ BUDDY refueling system for its Su – 30s, Mirages and Jaguars. The MiG fleet is being given in – flight refuelling capability as part of the upgrades. Efforts to build AWACs at home were hampered by inadequate trial platforms .One prototype was lost in an accident, along with its R and D team. The acute need for AWACS was felt in Kargil. The service will need at least six such aircraft. IAF has acquired special aircraft with ECM and ECCM cover. Anti–radiation systems like ARMAT, Kh–25MP, KH – 59 missiles and Harpy drones are such. The Jaguars are seen as primary EW support aircraft.[37]

3.4.5 Network – centric capabilities:

As the principal operator of India's nuclear weapons IAF has been building a C4I network that could survive a first strike. For this, radiation hardening and several levels of redundancy have been built into the network. It is also incrementally upgrading the strike fleet with EMP shielding.

India's air defence network is two parts – the Air Defence Ground Environment System (ADGES) and the Base Air Defence Zones (BADZ) which are linked and share information relating to air defence tasks. They are complemented by sensor networks and SAM units, giving a warfighting potential. In the late 90's an upgradation programme has started for the ADGES with Indian and Israeli radars. The Pectura SAM units are also undergoing upgrades with more sensitive seeker heads. There is a perceived need to augment the abilities of current sensor network to detect and track missile launches. It is

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[37] R Chattopadhay, n 32

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believed that the Akash SAM and Rajendra Phase array radar will bring in some amount of ATBM defence capability.

3.4.6 Logistics:

Operating in some of the most inhospitable terrains, the IAF transport and Logistics helicopter formations keep the army and air force supplied. During Kargil these squadrons provided air–bridge. India has the ability to air-lift a brigade with equipment; the largest military lift capability in Asia and some 1,080,000 Kgs in all. The An–32s constitutes IAF'S medium lift capabilities but they suffered spare shortage in the 90's. So from six, the operational squadrons were brought down to four and still maintains 1 ½ squadrons of Hs-748 military freighters. But both Hs-748 and An – 32s will have to be slowly phased out , due to shortage of spares. IAF also operates a solitary unit of MI – 26 heavy – lift helicopters.

IAF provides tactical air support to the navy for which, one Jaguar squadron has been ear–marked in the western coast. The squadron has a mix of Sea Eagle–armed Jaguar Is and IMs. The process has begun to convert a MIG - 27 squadron to cover the eastern coast. These aircraft work in conjunction with Navy's own assets – including Sea harrier and TU – 142. Transport aircraft may not be replaced for a long time to come. Advanced Light Helicopter is yet to enter service in large numbers IAF could consider reformation transport air craft like IT- 76 and AN – 32.

Chapter 4

India's Intelligence, Surveillance, Information Warfare Capabilities

4.1 Introduction:

The various aspects affecting the armed forces' modernisation under the basic framework of RMA have been discussed in the previous chapters. But as mentioned earlier, RMA is not about mere technologies in weapons and platforms. It is a different set of approaches to the concept of warfare, in which the armed forces do not act alone. It functions in co-ordination with other agencies thus integrating its capabilities of gathering information and using it to the home side's advantage. RMA also suggests a corresponding change in how the security establishment and the armed forces in particular is managed.

There is need too have better surveillance and intelligence collection, especially on the borders, and an extra eye on the fissiparous movements. Technologies can enhance these, but more than science, the determinant of success would be how the available information is organised, given a coherent form and put to the best use.

In the debate on knowledge based warfare, various terms are used to conceptualise this new shift in focus on things other than mere military hardware, nevertheless vital ingredients in a military operation and eventual victory. Terms like C3I, C4I etc are used in this context. To analyse India's capabilities in the field; one such coinage is taken, namely, C4ISR. It means Command, Control, Computers, Communications, Intelligence, Surveillance and Reconnaissance. India's capabilities and vulnerabilities in each of these key areas will be discussed in this chapter.

Debates on RMA usually suggest an overall change in approach to the conduct of warfare and management of defence forces. The changes in approach to these aspects in India were evident especially during the last years of 1990s, much of which bore fruit in early years of 21st century. We will see how.

4.2 Command and Control:

Throughout the nineties, there were strong debates on the need for changing the command and control system of the army. The new warfare would be joint endeavour in which not just all services of the army, but police and paramilitary forces and the intelligence apparatus will play crucial roles. The present structure, with each arm of the defence forces developing their own command and control systems and hierarchies would not suit such a concept of war. Therefore strong arguments were made in favour of a change in the higher defence set up. After India went nuclear with the 1998 May Pokhran tests, the need to have a nuclear command, incorporating land, sea and air-based delivery systems was felt. For that a proper command and control system had to be put in place.

However, given the service legacies and the rigid hierarchical system of the armed forces structure, it was not easy to change traditional mindsets. India's efforts and effecting far-reaching changes at the top notch did not meet with much success, as the personality clashes often prevailed over innovative application of the emerging possibilities of warfare. One such issue was the attempts at creating a Chief of defence staff (CDS).

A CDS is needed to provide a single point advice on defence matters such as threat perceptions, strategies, force levels, equipment and manpower policies. CDS would also issue joint military operational, training and logistics directives and respective services would continue to provide advice to CDS/JCS in respect of their service. But those who argue against jointness cite the reasons of India's specific security scenario. General VN Sharma once said, "I do not understand what role the Navy will play if there is an integrated theatre command in Kashmir."[1] In 1990, the Arun Singh Committee had suggested some path-breaking recommendations on decision-making, planning, management and financial control in the defence forces.

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[1] Vinod Anand, *Achieving Synergies in Defence* New Delhi: Strategic Analysis, Vol XXII no 10, Jan 1999, p 1497-1450

It suggested the reactivation of Defence Minister's Committee, (which was done in 1999); creation of the Joint Chiefs of Staff Office, and integration of Service headquarters with Ministry of Defence and integrated theatre commands. Though these proposals were generally accepted, the resistance came from the civilian bureaucracy. Political establishment has also shown indifference to the decision-making structures of military. Service chiefs generally operated on individualistic lines than jointly, each having his own perception.

Thus, the proposal for Chief of Defence Staff (CDS) was a result of over a decade of debate on the issue of management of higher defence, for a single-point advisory and control for the entire armed forces. As the key military adviser to the government and a point of co-ordination between the three services, CDS was also meant to co-ordinate India's nuclear forces. Union Cabinet decided to accept the group of Ministers' Recommendation for a CDS. But the inter-service rivalries came into fore when the then naval chief's name, who was the senior-most among the three service chiefs, was not supported by the Air Force.[2]

Airforce has been opposing CDS as it feels the post could decentralise its air assets, that its role as a 'strategic force' will be marginalised and also that air power will be treated just as a support arms for future land operations. Apparently, there was no consensus within the cabinet over Admiral Sushil Kumar's candidature for the post of CDS. Subsequently, Kumar withdrew from the CDS race.

In its highly classified 'Vision 2020', IAF suggested that nuclear air command should be created with all delivery systems (missiles) placed under its disposal rather than that of CDS. The paper suggested that the army does not need any, and may not have a nuclear role, even as it felt a nuclear submarine for the navy was too far away.[3] IAF thinks that CDS will be influenced by which service he comes from and also that it will introduce another layer in the decision-making ladder. CDS, it is thought, would be the permanent chairman, Chiefs of staff Committee (COSC), making him far more

[2] Shishir Gupta, *Down to Brasstacks* New Delhi: India Today, May 28, 2001, pp 44-45
[3] Ibid

powerful than any individual Chief of Staff. Chairman of COSC can take decisions only if the other two service chiefs concur.

CDS, on the other hand, was expected to convey independent assessments to government, and command the strategic forces, as also the newly constituted Defence Intelligence Agency. There is a prevailing perception that CDS can liquidate the powers of service chiefs. There are also political wrangles, with main opposition Congress saying CDS has larger ramifications on the defence establishment.

Instead of a network-centric warfare, there are many who believe in centralisation, as they think it would bring economy of effort. They argue that India's limited air assets and the flexibility of IAF's long-range power can be best exploited by using them centrally rather than frittering away air resources and dividing them between theatre commands.

As the debate on such far-reaching changes at helm of command and control continues, the concept of CDS is being tried at Andaman and Nicobar, with a tri-service organisation headed by a Joint Chiefs of Staff. Creation of a Strategic Command for command and control of nuclear weapons is essential. A joint organisation in the form of a Joint Strategic Command with components from all services and involved civilian agencies would positively achieve synergies of operations. But as discussed earlier, Airmen and soldiers seem to have different perspectives and sense of primacy. Air Doctrine tends to emphasise the strategic role of IAF, importance of counter-air operations (CAO) over offensive air support (OAS) and greater desirability of battle- air interdiction as compared to close air support.

In the Indian context, ideally all operations would need to be joint air-land operations and in certain theatres it will include the Navy also. The distribution of air effort between CAO and OAS would have to be jointly planned, based on visualised operational scenarios and situations. A tri-service exercise TriAmph-98 was carried out in 1998, which indicated the understanding in the services that joint training is an important ingredient for winning future wars. In India, certain geographical areas would need a tri-

service approach while in most theatres, a two-service approach is sufficient.[4] As of now, crucial decisions regarding security are made at the Cabinet Committee on Security (CCS), informally created in 1997.

The practice thus far has been the Cabinet Secretary drafting policies related to defence. But the security scenario is far more complex at present, for an already overburdened cabinet secretariat to match.

The National Security Council, set up by a Parliamentary decisions in 1990, has mostly remained a non-starter, often referred to as a tower of Babel, with different members articulating different viewpoints. [5] But on actual ground, it is the CCS, which looks after the management and decision-making in national security-related matters. A 30-member National Security Advisory Board (NSAB) has not been heard of much, since its inception.

Capabilities of military are not only related to development of hardware, but also to the lack of organisational capacity within armed forces and civil areas of government. Until the problem of overall organisation and higher direction of armed forces is addressed and overcome, India's military capabilities in the context of modern warfare are likely to be less than those suggested by the inventories at its disposal. [6]

4.3 Communication and Computers

4.3.1 Communication:

Knowledge-based warfare emphasised by the new RMA is heavily dependent on proper military communications. Information Technology has revolutionised the capability of human beings to communicate across limitations of geography and time. This has led to a renewed attention on improving the communication facilities of the

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[4] Kapil Kak *'Management of India's Security and Higher Defence'*, Strategic Analysis Vol XXII No 3 June 1998 pp 327-337

[5] Janaki Bahadur Kremmer *'In the Tower of Babel'* New Delhi: Outlook, February 1, 1999 pp 45-46

[6] Sandy Gordon: *India's Rise to Power in the* 2oth Century and Beyond, Canberra: St Martin's, 1995 p 345-348

defence establishment. Military communication requirements are peculiar and challenging, as they demand very high standard of reliability, raggedness, and sustenance in extreme temperatures. The end-to-end secrecy is also a great imperative.

Now with the opening up of economy and liberalisation of policies, India's private industry is offering high-tech communication systems and the defence forces are gearing up to seize this opportunity.

Software-driven electronic and processing intensive systems are required for Indian military communications establishment to fill in the existing voids and to match the adversaries whose acquisitions have kept pace with the unprecedented growth in electronic and information technology sectors. India's present inventory of military communication appears to be outdated even in the face of state-or-the art low cost options, which have permeated into civilian sectors.

Kargil Review Committee has recommended modernisation of communication interception equipment and augmentation of direction finding equipment. (Recommendation no 6). It suggested establishment of a single organisation like the National Security Agency of the USA, grouping together all communication and electronic intelligence efforts (recommendation no 7). But efforts in such direction are yet to happen.[7]

Though a good percentage of Army's communication equipment and procedures are outdated, it is in the process of upgrading the communication network. It has an ambitious IT proliferation programme and hopes to benefit from the private industry in this field. Army is also looking for quality systems for modernisation of its battalion and unit level communications.

India has both digital and analogous systems over a variety of media and communication networks. Majority of them are not interoperable, and are not suitable for a common command information and decision support system. Army Radio Engineering Network (AREN) and Army Static Communication Network (ASCON) are not

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[7] Kargil Review Committee Report available at http://www.rediff.com/news/2000/feb/28kargil.htm.

compatible to Air defence Ground Environment System (ADGES), but a process is on to integrate them.

Both AREN and ASCON are being upgraded to the next generation. These networks use optical fibre systems and satellites for communications. AREN can manage the fielding of as many as 35 different types of communication equipment including types of radios and radio-relay equipment, node and access switches, multiplexing and secrecy equipment as also systems for providing telephone communications for mobile subscribers. The AREN has been fully fielded and a Tactical Communication System finalised.

ASCON, which is a backbone network, has been implemented by the local industry. The existing ASCON networks have been expanded to include all commands and areas. Plans for its future expansion have been finalised. The existing microwave links of ASCON have been replaced with optical fibre cable.

Besides the ASCON and AREN, Corps of signals have communication networks using microwave, Ultra High Frequency, optical fibre systems and satellite systems with security overlays duly incorporated. Secure radio and VSAT equipment have also been inducted. Despite heavy odds, Signallers managed to provide speedy operational and rearward communication to fighting formations in the Kargil war. The electronic warfare support fielded in the valley played significant role in gaining information about the enemy's plans in Kargil.

Meanwhile, work continues on Army Strategic Operational Information dissemination System (ASTROIDS) and Defence Communication Network (DCN). DCN is envisioned as a seamless communication architecture between the three services. The concept envisages that while each service continues to develop its own network for their specific requirements, they get integrated at specified levels in the field, as also with MoD and other ministries, through the proposed DCN. Its system architecture will include nodes at strategic locations inter-linked to form a backbone network complemented by satellite network overlays and access networks, state-or-the-art transmission equipment, terminal equipment capable of providing all value added

services, networking management and control hierarchy at different levels. Approximate cost of the project is about Rs 500 cr to Rs 600 cr. [8]

In the field of satellite communications, the private industry has co-operated with the armed forces, in projects with combined worth of over Rs 1250 crores. But since defence communication with commercial satellites like Iridium or Hughes have further security problems, defence organisations should get more transponders on the Indian National Satellite (INSAT) 2 and 3 series of satellites. The INSAT 2C has three KU band transponders for VSAT communication. INSAT 2E, with 17 C-band transponder has tremendous scope to fulfil defence communication and networking requirements. The third generation INSAT 3 series will provide C-band, extended C-band and Ku band transponders for Satcom, which could be used for defence purposes.[9]

As of now, the INSAT-3B satellite has dedicated KU band transponders for the Army. The army-owned satellite communication uses the VSAT (Very Small Aperture Terminal) technology. These will provide secure speech and value-added data communications to the military formations, units and sub-units deployed in counter-insurgency in northern, eastern and southern sectors.

ITI Ltd has delivered the Low Intensity Conflict Operations Very Small Aperture Terminal System (LICO-VSAT) offering direct connectivity of voice and data to 20 centres, including Kargil, partapur (Siachen Base Camp) and Bhuj in Gujarat. Twelve more such units are in the pipeline, with in-built encryption. Army has also launched a LICO VSAT Hub station at Signals Enclave, a modern communication system that will bring force multiplication effect.

While the Department of Space has done excellent work in building up space segment capabilities, India still lags behind in indigenous capabilities in the ground segment. This makes India very vulnerable in terms of dependence on foreign sources for

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[8] from reports on the Seminar on *Military Communications: Role of Industry,* 10-11 August, 2000, new Delhi, available at the website of Chamber of Indian Industries' task force on defence www.ciidefence.com

[9] S K Tripathi *'A Perspective for IT: The Army in the Information Age,* New Delhi: Combat Journal, March 2000

most of the ground segment equipment requirements. Since optical fibre is considered the most secure and survivable for communications in a nuclear environment, Department of Telecom is planning to cover maximum locations in the country with optical fibre network. However, since Indian defence forces operate in remote, inhospitable terrain, laying fibre-optics cables will be a costly affair.

Signals have also undergone a modernisation drive in which it successfully implemented an Intranet for Army as also computer telephony integration. New technologies like ATM (Asynchronous transfer mode) switching for exchanges have been introduced. Kashmir valley and the Northeast now use VSAT and mobile satellite systems.

New communication projects such as UHF, VSAT and MODCOM are being introduced. For improving communication in Siachen, a project called MODCOM-102 has been introduced, as also the Integrated Communication Network (ICN). The existing microwave links of ASCON have been replaced with optical fibre cable. A strategic alliance has been formed with the Department of telecom for joint communication projects in remote areas in the Kashmir valley. Field trials have been done for 'Akash'- a tactical battle communication network. Sophisticated radio equipment including STARS-V frequency-hopping units are now being delivered. Older sets will now have speech encryption modules, attached to prevent interception.[10]

A tactical communication system 2000 (TCS2000) is planned to provide complete communication support in the tactical battle area. The Combat Net Radio will complement these efforts. All these networks will have to be secure, use multiple media, be interoperable and meet difficult and diverse conditions of terrain and climate in which the Indian army operates.

With rapid advances in technology, India's current communication projects could become obsolete and outdated. The need is to have reduced cycle time in development and even procurement and the overall modification of the existing system. By this, the

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[10] Sruti Kant *'Corps of Signals: The perfect Communicators*, Sainik Samachar vol 47, No 12, 16-30 June 2000 available at mod.nic.in/samachar/body.htm.

existing voids would be filled and the need to outpace the adversary will be served. Merely going in for commercial off-the-shelf technologies is not enough. Platforms for communication need be modified with ruggedisation and re-engineering software for enhanced features.

4.3.2 Computers:

Towards the end of 1990s, India was perceived as a potential Information superpower in 21st century, due to talent in information technology, minimum censorship in information and communication technologies, and the widespread use of the English language. Information technology is to India what oil is to gulf became a standard phrase. Many governmental initiatives were taken in this regard, especially the IT task force, the Group on Telecom and other Committees which looked into various IT-related issues. A draft New Telecom Policy 1999 was opened for discussion, which was approved by cabinet on March 1999. Also, a draft Information Technology Act was put up by the Department of electronics to the legal department, which was subsequently made into a law.[11]

By the extraordinary gazette notification 160 of July 25, 1998, the Indian government has expressed determination to be counted as a 'Third Wave' nation by 2008. It was proof that India recognised the potential of Information Technology and decided to take steps that would facilitate it emerge as an IT superpower. The National Task Force on IT and Software Development was set up, to draft a national IT policy. Prime Minister's Task Force Report on Information Technology has stated that information technology promises to compress the time it would take for India to advance rapidly in the march of development and occupy a position of honour and pride in the comity of nations.[12]

The Task Force's report in July 1998 'IT Action Plan' had 108 recommendations, including in the area of defence. IT is sought to be used as a force multiplier for defence.

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[11] Prashant Bakshi *Security Implications for a Wired India: Challenges Ahead* New Delhi: Strategic Analysis Vol XXV No 1, April 2001, pp 105-117

[12] Vinod Anand, n 1, p 1500

There is realisation that introduction of RMA features to Indian armed forces requires development of IT capabilities at the national level. The Indian Armed forces need to develop its own goals and vision for IT management perspective in the 21st century.

Army seems to have come a long way in setting up for itself certain targets for an IT roadmap. Army has formalised its vision in an 'IT Roadmap-2008'.

In consonance with the National policy, around two to three percent of the budget has been earmarked for IT and a large number of 'automation projects' have been undertaken, for which army had signed agreements with the private industry. Army IT Roadmap –2008's vision is to establish a strong IT infrastructure to act as a viable force multiplier by incorporating fully automated and networked operation information system and management information system, complemented by fully IT literate manpower. The vision document discussed creation of databases at all levels to provide information for quick decision-making by commanders at all levels for administrative as well as operational functions.[13]

Though Army has procured much hardware, it was not matched with customised application software and networking. The focus now is on identifying, developing and implementing application software for its end-users to provide them with enhanced office automation tools and thus create effective management of information systems.

Army is now stressing grass-root level automation and networking from field units to headquarters. At least seven automation projects for army are progressing as of now. They include administrative automation of army units, automation of record offices, branches/directorates at army headquarters, establishment of IT labs and formation headquarters, transformation of all orders/ instructions, forms, symbols to electronic media, healthcare automation and integration of medical services and facilities.

Army is developing IT-related technologies indigenously to cut costs and reduce dependence on field exercises and training that involve expensive equipment.[14] An extensive computerisation programme is being carried out in a phased manner. DRDO

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[13] *Action Taken Report of The National Task Force on Information Technology and Software Development,* New Delhi: Ministry of of Information Technology, Government of India, also available at www.mit.gov.in/atrnt.htm.

[14] R Prasannan *War Games,* The Week, March 1998 p 34-38

developed PC-based war-games to train officers, called 'Shatranj'. It is a software to train men at the battalion level, commissioned in 1998. '

Sangram', another software, is being installed at Army training Command. Army has also taken up the project to build an Intranet, interconnecting all its establishments and camps. Army Intranet needs to be extra-secure, must have enhanced survivability and must be using operating systems.

Army aims to increase information technology quotient per soldier, adopt available technologies readily and with speed, be aware of the emerging technologies in key areas, innovate and adapt from the marketplace and strengthen centres of excellence in strategic areas and enhance the pace towards self-reliance.

Army has taken the help of private industry in suggesting methodologies and packages to train the manpower in use and management of an IT-rich environment. Already, an Army Institute of Information Technology (AIIT) has been established at Hyderabad. Computer training institutions in the civil sector are training some of the army manpower. The Military Intelligence School and Depot in Pune has a Digital Imagery Analysis Centre (DIAC). It has the latest technology for training in satellite image analysis and interpretation. DIAC is the nodal agency for providing training on all aspects of digital analysis and interpretation and remote sensing. The system available is extremely versatile and highly advanced. It can take inputs from any type of imagery system.

4.4 Intelligence set-up:

In the nineties, the intelligence system, with each service having its own intelligence directorate was seen as inhibiting the exploitation of all available resources. It was not suitable for co-ordinated tasking of intelligence resources, often resulting in duplication of effort with each service doing its separate country and area studies and analyses. It impeded flow of information and analysed data between defence and civil agencies, due to attitudinal barriers, information hoarding, insufficient knowledge of the function of other intelligence organisations, procedural delays and obsolescent methods of exchanging information. The result was lack of centralised prioritisation and rationalisation of intelligence thrust areas and action plans.[15]

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[15] Kargil Review Committee Report, n 7

The joint intelligence committee (JIC) co-ordinates the national intelligence organisation and prepares status papers and strategic applications. But in late 90s, Joint Chiefs of Staff Committee proposed a Defence Intelligence Agency (DIA), to overcome the near-total absence of actionable intelligence. A common DIA would solve a number of maladies of our present intelligence systems. The Kargil Review Committee also recommended an integrated DIA. In fact, Prime Minister V P Singh granted the secret authorisation for DIA as early as 1990-91. But noting much was done on this in the rest of the decade. [16]

Many of the hostile groups operating within the country currently benefit from the expertise of foreign intelligence services and are able to latch on to frequencies, and can also demodulate radio frequency transmissions that have been modulated and demodulated after transmission. Almost all messages now need to be encrypted and online encryption is of immediate necessity.

Therefore, above anyone else, it was the intelligence community that received a rude shock in the aftermath of Kargil conflict, in which it was caught napping while the terrorists infiltrated from across the border, with tacit support from the Pakistani regulars and its intelligence establishment. Inadequate co-ordination at the ground level among army intelligence and other agencies was later widely criticised. This was lacking even at the Joint Intelligence Committee (JIC) because of the low level of representation by Director General of Military Intelligence (DGMI) at the assessment process and the DGMI representative not coming fully briefed on the latest situation.

India's external intelligence agency Research and Analysis Wing (RAW) facility in the Kargil area, primarily responsible for collecting information on adversary's military deployment, did not receive enough attention in staff and technological capability, weakening intelligence collection, co-ordination and follow-up. In most advanced countries, the armed forces have a defence intelligence agency with a significant intelligence collection capability, which ensures that there are two streams of

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[16] Praveen Swami *A New Intelligence Organisation* Chennai; Frontline march 2002, pp 124-125; Shishir Gupta *'The New Order'*, New Delhi: India today, June 4, 2001 pp 46-47;. Ranjit Bhushan *'Given a Raw Deal'*, New Delhi: Outlook, June 21, 1999, pp 30-32

intelligence, which enable governments to check one against the other. But in India, threat assessment is largely a single-track process dominated by RAW.

Indian intelligence structure is flawed since, there is little backup or redundancy to rectify failures and shortcomings in intelligence collection and reporting that goes to build up the external threat perception by RAW. It is neither healthy, nor prudent to endow that one agency alone with multifarious capabilities for human, communication, imagery and electronic intelligence. Such process of intelligence gathering and reporting lead to an overload of background and unconfirmed information and inadequately assessed intelligence that required being further pursued.

There is no institutionalised process whereby RAW, IB, BSF and Army intelligence officials interact periodically at levels below the Joint Intelligence Committee. The army never shared its intelligence with the other agencies or with the JIC. There was no system of Army authorities at different levels from DGMI downward to provide feedback to the agencies. The general lack of awareness on the critical importance of and the need for assessed intelligence at all levels is lacking.

The assessment process had been so downgraded that various agencies send very junior officials to JIC meetings. The DGMI did not send any regular input to the JIC for two years preceding the Kargil crisis. The post of chairman of JIC was left vacant for 18 months until December 1998. There was no system of regular periodic and comprehensive intelligence briefings at the political level and to the committee of secretaries.

It is imperative to have an institutionalised mechanism for co-ordination or objective-oriented interaction between intelligence agencies and consumers at different levels. A mechanism for tasking the agencies, monitoring their performance and reviewing their records to evaluate their quality is lacking. Nor is there any oversight of the overall functioning of the agencies.

Therefore a thorough examination of the working of the intelligence system with a view to removing theses deficiencies was stressed by the Kargil review Committee. Though the efficacy of the JIC has increased since it became part of the National Security

Council secretariat, its role and place in the national intelligence framework should be evaluated in the context of the over-all reform of the system.[17]

Meanwhile, Intelligence Bureau (IB) officers reportedly complain about lack of technical experts. The technical cadre is simply unable to cope with the new challenges before them. The organisation has not even been able to set up a basic in-house database system. It has reportedly prevented Internet connection for staff offices for fear of penetration. Though IB has a functional communication and telephone interception capability, the organisational culture and its rigid hierarchy will have to be removed to make best use of the new technological advances. [18]

Saxena Report had suggested that IB be given a charter, of which there is still not much movement. The report also recommended that the IB Director be freed from having to report to the Home Secretary, so that Ministry of Home Affairs stops treating IB as just an appendage or subsidiary unit. But as of now, the IB director does not enjoy any authority to compel his ministry to take the kind of action necessary for upgrading the state police forces, which the Saxena report had suggested.

4.5 Surveillance and Reconnaissance:

Knowing one's enemy well in advance is the key to an information-oriented warfare. For this, capabilities to see deep into the enemy territory and understand its troop movements will have to be developed. A variety of technologies have been perfected in recent years for this purpose. They are sensors and surveillance devices, which operate from the ground, from the air as also from outer space. From ground, the devices include ground sensors, radars, border monitoring devices, night vision equipment, and thermal imaging systems. From the air, there are unmanned aerial vehicles (UAVs) also called Remotely Piloted Vehicles (RPVs), and surveillance and reconnaissance planes. From space, the satellites with remote sensing capabilities can be used for military purposes, to look deep into enemy territory. In all these areas, India has some amount of capabilities, but not extremely secure or satisfactory. The capabilities in space technology are yet to

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[17] Kargil Review Committee Report, n 7, Recommendations 9, 10, 11

[18] . Praveen Swami, n 16

be fully utilised for military purposes. But the potential in these areas is definitely impressive.

The Kargil war exposed the absence of proper technological monitoring of the borders. The army and other security forces have lagged behind in the quality of their surveillance equipment although technologically superior equipment was readily available in the world. Only after the Kargil intrusion was direction-finding equipment acquired. Helicopters employed for air surveillance patrolling did not have sophisticated monitoring and sensing devices. The Kargil battle was fought with less than optimum communications, surveillance and reconnaissance capability. While self-reliance and indegenisation are sound principles, the availability of critical equipment in time of combat is the supreme consideration that must govern acquisition policy.

While Kargil highlighted the gross inadequacies in the nation's surveillance capability, particularly in satellite imagery, steps have been initiated to acquire this capacity. Some Unmanned Aerial Vehicles (UAVs) have been inducted by the armed forces and are operating in the plains under the charge of the army.

High altitude UAVs need to be acquired in large numbers, as they could prove effective in counter-insurgency operations, and may replace human patrols in the long run. Employing UAVs is extremely important as they would enable aerial monitoring of the LoC without putting aircraft and aircrew at risk, a classic replacement of the man with machine. But acquisition of high altitude UAVs has to be complimented by institutionalised arrangements to ensure that imagery generated by them is disseminated to concerned intelligence agencies as quickly as possible. [19] Army has acquired Israeli searcher MK II UAV. It can fly upto 12 hours deep into enemy territory and provide real time or continuous target data. The indigenous Nishant UAV is also around. DRDO also has developed some remotely piloted vehicles. They fly at slow pace and spy on enemy, sending down pictures and data in real time. Even if they are shot at by heat-seeking missiles, they can be de-throttled from the ground. They have a larger radar profile and are cheap, therefore dispensable. [20]

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[19] Kargil Review Committee report, n 7, Recommendations 4, 5

[20] Prasannan, n 14 p 36

A satellite imagery capability of world standard has to be developed indigenously and put in place in the shortest possible time. Instead of creating a surveillance system for the armed forces alone, it would be wise to source satellite imagery from the already existing strong line of civil-purpose satellites.

Indian Space Research Organisation (ISRO) has a significant civil remote-sensing satellite capability, which can be tapped for military surveillance and reconnaissance also. ISRO's satellite programme, originally meant to help India plan how to utilise its natural resource, have now 20 per cent of the global market for commercial satellite imagery. ISRO has five remote-sensing satellites (Indian Remote sensing satellites or IRS) and the sixth one with one-metre resolution is planned to cater to defence purposes alone, only the second such satellite in space. In its continuous process of modernisation, advanced sensors have been put on these satellites, to peer through even snow-capped areas. These cameras in the satellites can view objects on the earth from an 800 KMs orbit. ISRO now plans to have satellites with more advanced sensors and at least one satellite with a 2.6 meter resolution, basically used by spy satellites, which would help the defence segment. [21]

In the TriAmph-98 exercises, the picture sent by IRS-1C at pan 91-53 B were taken from a height of 850 kms and showed every sand-dune and tank-navigable paths across the Thar desert. In the army, the task of locating enemy guns and mortars is with the surveillance and Target Acquisition Branch (SATA), which have Stentor long-range battlefield surveillance radars (BFSRs) and Cymbeline mortar locating radars. Satellites such as French SPOT, Russian KRV-1000, the Indian IRS-C and the Canadian RADARSAT could be purchased by India at relatively lower prices.[22]

Satellites surmount line of sight limitations and extend the range of voice and data transmissions crucial to a fast and responsive command and control system. Surveillance satellites provide inputs to be acted upon by agencies including surface and aerial weapon platforms. Army has expressed the need for military satellites so did Air force and India

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[21] B R Srikanth *Satellite Imaging: Long Site* New Delhi: Outlook, January 14, 2002 pp 147- 163

[22] Prasannan n 14, p 37

has the wherewithal in satellite technology. In the long run, India cannot rely solely on commercial satellites, whether Indian or foreign. It will have to develop high-resolution military satellites for monitoring its many disputed borders.

Aerial sensing methods could employ photographic and video cameras, both visual and infrared sampling instruments and radars. The IAF already has well-established capabilities in aerial sensing, which include a squadron of MiG 25 aircraft employed in the strategic reconnaissance role, an electronic intelligence unit comprising Boeing 737 aircraft, and a proven photographic interpretation expertise. IAF has reconnaissance flights, which can use long-look optical systems (LLOS), infrared line scan (IRLS) and synthetic aperture radars (SAR). Aviation Research Centre of the RAW has its own specialised capabilities in this field. Further investments into these vital capabilities are essential.

Regular air force and army aviation reconnaissance sorties need to be flown to detect intrusions. The IAF should acquire additional surveillance assets, where necessary and feed its inputs to a national level intelligence collection, collation, compilation, analysis, synthesis and dissemination centre. This, combined with human intelligence, (humint) will enable a comprehensive border surveillance and intelligence acquisition plan.

Kargil has established the vital need to monitor the borders. Technical monitoring of the LoC through both on-site and remote sensing could prevent another Kargil and yet avoid a Siachen. Ground sensors would be another category of technical verification measure, which would include seismic, acoustic, magnetic, infrared, thermal and radar devices. Ground surveillance means also include battlefield surveillance radars (BFSRs) and Un-attended ground sensors (UGS) in remote areas.[23]

Such sensors could be used to monitor the movement of troops or equipment along access routes to deployment areas, to detect the provision of aerial supplies to forward positions or to monitor base camps away from the Line of Control.

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[23] Varun Sahni *'Preventing Another Kargil, Preventing Another Siachen'* in Kanti Bajpai et al (eds) *Kargil and After : Challenges for Indian Policy* New Delhi: Har Anand 2001, pp 147-156

India has acquired and begun licence-production of France's Stentor battlefield surveillance radars. It can track movement of vehicles and troops at ranges of 20-31 KMs. There were discussions in the late 1990s for Israeli Elta ELM-2140 battlefield surveillance radar. Army has also procured a range of close-observation night vision devices and thermal imaging systems.

India will also have to place optical, video, motion and thermal sensors in the camps and posts vacated during the winter months to ensure the continued lack of human presence in them. Radar, seismic and acoustic sensors would have to be employed to verify Pakistani air activity. Multi-spectral optical, infrared and radar photography capability are necessary for effective surveillance by day and night. Electronic surveillance means also provide an excellent means to gain information about the plans and movement of regular enemy troops, irregulars and terrorists. All these capabilities are yet to be fully explored.

This is not to suggest that the machine can replace man. After all, it the human agency and ingenuity that would design, produce, test, deploy and replace the sensing devices. The data from both on-site and remote sensing devices would be interpreted by human beings. The machines would not replace man, but would replace the man on the Line.[24] Therefore, appropriate force structures and procedures should be evolved for managing the borders, to deal with inflow of narcotics, illegal migrants, terrorists and light arms proliferation.[25]

There is bound to be distrust in technical monitoring at first. But with the passage of time, the Indian Army would begin to gain confidence in, rely on and trust the sensing devices. Once both sides reach border deal, the unilateral technical monitoring might be replaced by co-operative technical monitoring.

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[24] Varun Sahni, n 23 p 156
[25] Kargil Review Committee Report n, 7 Recommendation 14

4.6 Information Warfare capabilities:

Traditional military information security has revolved around the concept of specialised facilities to encryption and decryption of messages. During transit and storage, data is open to various security threats. Traditionally, manual cryption systems had been used by Indian defence forces to safeguard the access to data and data integrity. But traditional methods fail to meet the current speed and quantity needs. This makes the information security issues more complex. In modern times, widespread deployment of computers and computer networking has created vulnerabilities that did not exist before. Adequate attention had not been paid in India to develop encryption and decryption skills

Advanced software techniques have now been introduced for cryptography and crytoanalysts. With increasing parity among conventional elements of warfare, the difference between the victor and the vanquished often shall be in effective, rapid deployment of information across networks and chains of commands, stretching up to the individual on the battlefront. [26]

Very few Indian establishments are seen to be using encryption technologies regularly. While the Intelligence Bureau and the RAW have secured some key voice and fax lines, many communications, including satellite telephones remain unencrypted.[27]

The DRDO and the CVC have sounded Red alert on the purchase security-related software, especially data encryption systems, because these software can be broken by the US national security agency. This makes it imperative for India to develop its own security software. [28] The armed forces have recommended to the government (IT Task Force Recommendation 104) that defence cryptographic systems be made available to the civilian sector to enable electronic fund transfers and digital signatures. India can make cryptographic algorithms, which will be difficult to crack.

It was observed that irrespective of its strengths in information technology, India could be severely battered if an enemy country launches a concerted cyber-offensive.

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[26] Akshay Joshi Information Technology and Security, an Update, New Delhi: Strategic Analysis Vol XXIII No 2, May 1999, pp 255-270

[27] Praveen Swami The Surveillance Scene Chennai: Frontline April 13, 2001 pp 134-135

[28] Akshay Joshi , n 26

Doubts are Often raised as to whether India is prepared to wage a war in the bloodless war-zone called cyberspace. Many a ministry's websites, including that of external affairs and defence have been hacked by pro-Pakistani web-warriors.

India and Pakistan have been fighting a war over information, with several Internet resources hacked in both countries. With some of the best software manpower in the world, the fighting becomes even more ferocious. Several top Indian and Pakistani computer professionals are helping their respective governments by supplying information on the best way to harm the enemy's computer systems.

The Indian defence establishment was given a rude shock when amateur hackers broke into the web-sites of Bhaba atomic centre and Indian Army. In the Baba hacking incident, a group of Australian and American teenagers opened the email system of the Atomic Centre, soon after the 1998 Pokhran II blasts. BARC's internal network password was hacked. And since the server of army web-site (armyinkashmir.com) was not located in India, it was easy to crack. [29] Pakistan hackers posing as Indians rang up the controllers of the web-site and asked them to change the IP address of the website to another address.

The Indian government traced this hacking to a Pakistan-based information services firm. The hackers had managed to divert all logins to the Indian site to their own in Pakistan for two days. During Kargil also, the site www.armyinkashmir.org was attacked. With about 200 e-mails of support and financial help being received daily by the Indian government at this web address, the mail component of the web-site was tampered with. All pro-Indian e-mails were diverted to a different address. The Indian armed forces however used some best computer professionals in the country and recovered the site from the hack attack.[30]

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[29] 'Information Warfare: Is India Prepared for it? , New Delhi: Times of India, 14 May 2001

30 B Raman *Proxy War in Cyber Space* New Delhi: Indian Defence Review, Vol 15 (4) October-December 2000, pp pp 138-165; Prashant Bakshi *'Hackers: Warriors of the Wired World'* New Delhi: Indian Defence Revirew Vol 15 (4) October October-December 2000 pp 115-123; Adam L Penenberg *'Hacking Bhaba'* New York: Forbes Magazine, November 16 1998 at www. Forbes.com/1998/11/16/feat_print.html

Indian government, on its part had cut off all network access to Pakistan's prominent newspaper Dawn in 1999 for a fortnight, but restored it after opposition from home. Most of the government sites on both sides of the border have been attacked.

The high-profile and sensitive websites hacked into include that of Department of Atomic Energy, Indian Institute of Science, Ministry of External Affairs, Department of Telecom, and University Grants Commission. Pakistani hackers with odd names like GFORCE Pakistan, Muslim Online Syndicate, Silver Lords, Kill India, Dr Nuker have managed over 260 events of defacing Indian websites. The Pakistani propaganda websites like roguearmyout.com wage a symbolic battle against India on the cyberspace. Their activities also include directing unwitting Internet surfers to anti-India websites and ciruclating instructions on how to break into Indian websites. At least 635 websites had been hacked into, which include commercial ones. Though the other hackings can be considered as of nuisance value, the breaking into commercial sites can cause economic damage. Also sensitive hacks like BARC and Indira Gandhi Centre for Atomic Research can compromise national security. Recently, it was noticed that some Chinese groups have also hacked into some Indian websites. One such group cracked open the Public-sector unit CMC Ltd's site and flooded it with anti-US slogans, ostensibly because India's open support of American proposal of Nuclear Missile Defence System.[31]

India is a very soft target for cyberwar attacks, as many companies and government sites do not care much for computer security and network security. Web hosts are more concerned about getting their sites online than about security issues. As a result, roughly two Indian websites are defaced by Pakistani hackers each month. Not even a single hacker has been caught or punished, as tracking them is extremely difficult. The Information Technology Act had declared hacking an offence, irrespective of its objective, punishable by Rs one crore, making it impossible for Indians to respond in the same coin.

However, India has practised some propaganda war in the hacking of websites of Pakistan government and that of terrorist outfit Lashkar-e-Toiba. The Indian army now

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[31] Malini Goyal *It's WWWar* New Delhi: India Today, June 18-2001 pp 52-52

has an internet cell which takes help from highly skilled computer professionals. The basic function of these web-warriors is to defend Indian military installations from hackers.

As information technology becomes synonymous to social, economic and military survival, the armed forces are being compelled to create a Defence Information infrastructure (DII) to meet the emerging threats and vulnerabilities of cyberspace. Creation of DII and electronic security infrastructure is essential for the higher management of the armed forces. Presentations have been made to the armed forces on DII as a 'system of systems', consisting of a set of network-centric applications and comprehensive e-security overlay, a suite of professionally managed support services and high end research, design and development. For this the defence forces would need consortium level partnerships with the industry. Ideally, the DII should have encryption, identification, authentication, access control devices, intrusion detection systems, network surveillance etc. Armed forces can also make use of professional services like vulnerability assessment, security planning, design and integration of e-security overlay, contingency planning, disaster management and post deployment support.[32]

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[32] Akshay Joshi, n 27

Chapter 5

Financial Problems and Private Participation in Military Technology

5.1 Introduction:

For truly modernised armed forces, the budget support will have to be consistent with the requirements. In India's case, often the defence budget has been decided by sentiments and politics than by pragmatism. Improvement of systems by purchase and upgradation or local research requires fund support from the government. There is a debate that India is spending too much on defence, at the peril of development. But many believe that national security is the first step to development. Western analysts often say that for a country as poor as India, budget trends are incompatible with its genuine needs and relative capacity to spend. But others have argued that the spending for the services is in tune with global and regional trends.

5.2 Budgeting trends:

The period 1984-89 witnessed a consistent rise in defence outlays in total government expenditure, from 9.9 per cent to 10.3 per cent. In 1988, India's defence expenditure was 4 per cent of its GDP. The 1990s were a period of economic stagnation, leading to the largest cut ever in defence budget, though Ministry of Defence remains the largest beneficiary of the budget. In fact, high defence expenditures of 1980s contributed to large fiscal deficits, adversely affecting balance of payment. In 1993, an RBI report attributed the balance of payment crisis of 1990-91 to arms imports during late 1980s. By 1993-94, defence allocations were reduced to 2.44 percent of the total budget.[1]

Resources for defence have been forthcoming at fairly steady levels, reaching an all-time high of 3.59 per cent of GDP in 1987-88. But this has fallen sharply to 2.54. percent of GDP between 1990-91 and 1997-98. As a percentage of central government expenditure, it has fallen from 22.73 percent in financial year 1971-72 to 13.58 in 1997-98. But in current rupees, the defence expenditure has grown from the Rs 11,967 crores

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1. Stephen P Cohen *India: Emerging Power*, Washington DC: Brookings Institution Press, 2001 pp 151-155

in 1987-88 to 35,620 crore in 1997-98, which works out to an average decadal growth rate of 11.68 per cent. [2]

As the early 1990s saw a reduction in military expenditure, changes in military doctrine, cuts in force structure and recruitment appeared inevitable, given the serious economic situation. But the 1999-2000 budget, coming as it did after the Kargil war, significantly increased funds for space and nuclear related activities. It also called for an increase of 28 percent in defence outlays. [3] In it, the army's share was 55.29 percent, compared to Navy's 14.8 and IAF's 22.49 percent. For research and development, 6.07 percent was earmarked, while for defence production, it was 1.35.

The non-manpower-related capital account in constant rupees for weapon systems, equipment acquisitions, combat stores, spares, ordnance and fuel has increased in current rupees. It went up from Rs 3107.6 crores to Rs 8907 crores, representing a decadal average growth of 11.36 per cent. But at constant 1981-82 prices, the expenditure increased from Rs 2156.3 cr to Rs 2658.8 cr, which is a decade growth rate of 2.41 per cent only.

The period 1987-88 to 1997-98 has dealt severe blow to the defence modernisation process with growth averaging 2.41 percent. Lowered levels of modernisation, training status, operational logistics and maintenance were the obvious results. As of 1998, the army's modernisation budget for the next six years had been slashed from the defence ministry's recommended 25,000 cr to Rs 9546.46 cr. After meeting contractual obligations, only Rs 1454.62 cr was left. [4]

While stores and stockpiles were run down in the 1990s, a period of relative austerity and limited growth in the defence budget, new equipment was purchased in the

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[2] Kapil Kak *'India's Conventional Defence: Problems and Prospects'*, New Delhi: Strategic Analysis February 1999 Vol XXII, No 11, pp 1639-1665

[3] Timothy D Hoyt *Modernising Indian Armed Forces*, Washington DC: Joint Forces Quarterly, Summer 2000 p 17

[4] Kapil Kak, n 1

Kargil aftermath. But despite higher levels of spending in the last three years of the decade, the military largely remained hollow.[5]

The force structure has been maintained at the expense of its serviceability and sustainability. Many weapons systems acquired from multiple sources stressed logistics and support services. Force multiplier acquisition has been minimal. Analysts felt that the rising cost of sophisticated military equipment could lead to reduction in force levels of air force and stagnation in Navy. Inducting more force multipliers could fill these gaps. [6] There is need for higher allocations on capital accounts to rectify imbalances in defence modernisation.

Manpower costs are rising at over 13 per cent annually. For the army in particular, the imbalances in the man-machine mix continue. Stepping up of budgetary allocation in principle to at least 3.5 per cent of the GDP and sustaining it at that level for a 15-year time horizon may be the only solution to long-term defence planning. It could permit induction of affordable high-tech weapons.

Between 1987 and 1997 India's military spending has been at best fluctuating. From the 7690 mn USD of 1987, it went down to 7650 mn USD in 1990, to further down at 7080 and 7010 at 1991 and 92 respectively. It went up and touched the 8590 mn mark in 1994 and went further up to USD 10,300 mn in 1996.[7] Meanwhile, allocations for research and development have been minimal. Budgets after 1991-92 have restored R and D share, though not adequately. The sixth report on the parliamentary standing committee on defence (1995-96) suggested that R and D allocations should increase to at least ten percent of the defence budget. But it was 5.34 percent in 1996-97 and 5.23 percent in 1997-98. DRDO plans to increase the indigenous content of defence equipment from 30 percent in 1995 to 70 percent in 2005. For that the above percentages are not enough.

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[5] Timoty D Hoyt n 3

[6] Sandy Gordon: *India's Rise to Power in the 2oth Century and Beyond,* Canberra: St Martin's, 1995 p 348

[7] Anthony H Cordesman: *The Conventional Military Balance in South Asia: An Analytic Review*, Washington D C: Centre for Strategic and International Studies, Feb 27, 2000 p 9

For the army, for proper modernisation at least over Rs 500 crores will be needed. A desirable mix suggested by some analyst is Rs 100-250 crores for hardware, Rs 100-200 cores for software, between Rs 5 crore to 10 crore for specialised training and between Rs 10 crores to 20 crores for other peripheral expenditures. Both Arun Singh Committee and 10th finance commission has pointed out the need for taking into account the increasing cost of military hardware and software while allocating defence budget. At present nearly 88 percent of army budget is spent on manpower and manpower-related costs; like pay and allowances, stores, supplies etc, leaving merely 4 percent for modernization. Manpower costs have grown between 1988- 98 at 13.4 percent annually.[8]

In actual terms, the budget outlays for Navy has increased from Rs 1001 crores of 1985-86 to Rs 6700 cr in 1998-99. But at constant prices, this is not a significant growth, because the building and maintenance costs of ships and submarines have gone up over 10-15 times in 14 years due to inflation and devaluation of the rupee. This has resulted in funding support falling short of planned projections. In 1988, the navy's share was 13.5 percent of the total budget. It went down to 11.5 percent in 1992-93. The share crossed 14 per cent in 1995-96. There was a decline in 1996-97, back to the 11.67 mark. In 1998-99, it was the highest in recent times, at 14.8 per cent. The Committee on Defence Expenditure has recommended it to be between 18 and 20 percent.[9]

Allocation of Defence Budget for the three services in percentage terms			
Fiscal Year	Army	Air Force	Navy
1988-89	60.45	22.51	13.48
1989-90	59.64	23.07	13.53
1990-91	60.12	24.06	12.73
1992-93	59.29	22.40	11.21
1993-94	57.58	27.32	11.62

Source: Rahul Roy Chaudhury, Sea power and Indian Security p 188

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[8] Kapil Kak, n 1
[9] Ibid

Often, an argument is raised that India's spending on defence is too high and that it is not spending enough for development. But some economists defend this, saying India's defence expenditure is justified for the kind of threat perceptions India has. Given the security environment within which India lives, its defence expenditure is in fact in line with global trends and below par in the region itself, as China and Pakistan spend far more, out of line with global and regional trends. [10]

China's official line on defence expenditure is between five to six percent of GDP, while actual spending could much higher. For Pakistan, it is between seven and eight percent of GDP. While India and Pakistan failed to sustain modernisation process into the 1990s, Chinese defence budget grew by a staggering 159 percent in 1986-94 period along with downsizing of manpower and mechanisation of forces. It improved war-fighting capabilities through improved co-ordination between the services, rapid response, electronic warfare, logistics support and battlefield survivability. China continued to modernise its forces through the 1980s and 90s, while incorporating the information warfare paradigm in its concept of People's Warfare.

While India's defence expenditure is 13th largest in the world, considering its size, the spending is conservative. In the last 7-8 years, the budget outlays are below three percent of GDP.

Country	Defence expenditure as percent of GDP		Per-capita Defence Expenditure	
	1998	1996	1985	1995
India	3.4	2.5	11	9
China	5.1	3.9	26	26
Pakistan	6.9	3.8	29	28
USA	6.5	3.8	52	35
Japan	1	1.1	243	401
Germany	2.9	1.7	634	509

Source: Human Development report quoted by Sanjaya Baru (see note 10)

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[10] Sanjaya Baru *The Economic Consequences and Context of the Kargil Conflict* in   Bajpai et al (eds) *Kargil and After: Challenges for India's Policy*, New Delhi: Har Anand, 2001 p 128-132

While many argue for a defence budget of four percent of GDP, others feel the ceiling could be 3.5 percent, which could assist in expediting the long-stalled modernisation process and help bridge the technological gap between India and China.

While allowing for the 'more for development' argument, India will have to take into account the fact that it has never been part of any military alliances and is not protected by security umbrella. A 'realistic' Defence/ GDP ratio of 2.6 per cent to 2.9 percent is required to sustain the need to modernise the armed forces, assuming that GDP growth is sustained at around seven percent.

India's defence spending remains modest compared to other countries with major security concerns. India is a cost-effective defence spender and it retains the margin for increase sending over the next year without going seriously out of line with the long-term trend rate and world average of defence to GDP ratio.

Financial year	Defence spending as percentage of GDP	Defence Spending as percentage of Central Government Expenditure
1990-91	2.88	14.69
1991-92	2.65	14.50
1992-93	2.49	13.96
1993-94	2.69	14.75
1994-95	2.41	13.92
1995-96	2.40	14.01
1996-97	2.31	13.58
1997-98	2.47	15.52
1998-99	2.56	15.37

Source: *Institute of Defence Studies and Analysis, New Delhi, 1999, quoted by Sanjaya Baru (see note 10)*

5.3 Defence Research, Development and Indigenous Production

The thrust of indigenous capabilities in modernisation is definitely on defence research and production. While India has defence research organisation, ordnance factories and defence PSUs, there are a number of limitations these establishments face. The funding is one problem to begin with. From the discussion on budgeting trends above, it is clear that

the budgeting for research and development has been much lesser than manpower and maintenance costs. Defence research and development establishment has not always been able to live up to the standards and requirements of the services. There were incessant delays in crucial indigenous projects like the missile development and the light combat aircraft. Often, products developed by the defence researchers were sent back, as the defence services were not satisfied with their performances.[11] Cases include the INSAS rifle, Arjun tanks and the Advanced Light Helicopter. In most cases, the products are not entirely Indian, requiring foreign help, which again was dependent on a variety of technology control regimes. An example is the engine and powerpack of Arjun main battle tank, which was of German origin. Induction of the engine into the rest of the package took time. In the case of the engines for LCA from the GE electronics, USA, the supply was stopped after India 's nuclear tests, delaying the project for many more years. While Indian Airforce is the captive market for the products of Hindustan Aeronautics Limited, many of the products have been seen to have flaws. There are not enough facilities to overhaul the Soviet origin equipment with much of the Air Force and the Navy, for want of spare parts. In the case the navy, the workers unrest and dockyard strikes have further delayed some crucial projects. The ordnance factories are large behemoths, often producing products of the World War vintage, whose ability to produce anything of the new RMA technologies is at doubt. Much of what the defence research and development set-up produces is peripheral to the defence forces, and, strangely enough, a lot of it caters to the civilian sector than to the defence sector.

At present, 39 ordnance factories operate all over India. Their products include field guns, anti-aircraft guns, mortars, small arms and ammunition for weapons and guns, rockets, projectiles, pyro-techniques, bombs, grenades, mines, demolition charges, depth charges, infantry combat vehicles, battle tanks, self-propelled guns, transport trucks and patrol vehicles. At the logistics level they produce high-altitude and combat clothing, optical and fire control instruments, engineering equipment, supply dropping equipment including parachutes. The gross volume of production of ordnance factories has risen

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[11] Harinder Baweja *'Defenceless Delays'* New Delhi: India Today, May 7, 2001, pp-62-64

from Rs 1,846 cr in 1987-88 to Rs 2225 crore in 1991-92. The budgeted gross value production for 1992-93 is Rs 2500 crore.

Some of the more important productions are the 5.56 mm indigenously designed weapon system, bombs for IAF, liquid fuel for Prithvi and Agni missiles, ignites and copper-liners for Prithvi's warheads.

The heavy vehicle factory in Avadi produces the T-27 'Ajeya' tank, while Medak Ordnance factory builds the BMP-II 'Sarath' infantry combat vehicle. A modern opto-electronic production unit has been set up at Dehradun to produce opto-electronic fire control and night vision devices required for Ajeya tank and Sarath vehicle.

Among the eight defence PSUs, Hindustan Aeronautics Limited handles the design, manufacture, repair and overhaul of aircraft and helicopters. HAL is currently manufacturing Jaguar, Dornier-228 and MiG-27 M aircraft, Cheetah and Chetak helicopters. HAL is pursuing the design and development of an Advanced Light Helicopter (ALH) whose first prototype flew on August 1992.

Bharat electronics Limited makes over 350 products, including communication equipment, radars for military and civil use, optical and opto-electronic equipment, sound and vision broadcasting equipment and electronic components.

Mazagon Dock Limited is the country's leading shipbuilder. It can build warships of upto 6000 tonnes displacement. MDL has units at Bombay, Nhava and Mangalore and is headquartered in Mumbai. MDL is engaged in constructing submarines, missile boats, and destroyers for Indian navy.

Bharat Dynamics limited is the prime production agency for manufacture of India's new missile systems, Nag, Prithvi, Trishul and Akash, all being developed indigenously. It also takes up manufacture of 7.62-mm self-loading rifles and 9-mm pistols.

Defence Research and Development Organisation (DRDO) covers vital aspects like aeronautics, rockets and missiles, electronics and instrumentation, combat vehicles, engineering, naval systems, armament technology, advanced computing, artificial intelligence, robotics and systems analysis among others. DRDO has made significant achievements in developmental processes. They include flight simulators for aircraft,

brake parachute for fighter aircraft, remotely piloted vehicles, light field gun, light weight small arms systems, charge line mine clearing vehicle etc. It has also developed cluster weapons systems for fighter aircraft, naval mines, next generation bombs and high-speed aircraft. It created the 130 mm Self-Propelled gun, low-level tracking radar 'Indira I and II' for army and Air Force; light field artillery radars and battlefield surveillance radar. DRDO has also developed advanced ship sonar systems, advanced sono buoys, naval decoys, naval simulators torpedo launchers, parallel processing computer and aerodynamic computations.

But DRDO's priced projects are the development of Arjun main battle tank and the Integrated Guided Missile Development Programme. The organisation has also developed an all-terrain ambulance and an Ex-tank an upgraded version of the Arjun, which has incorporated many features of Russian T-72, as well as a bridge-layer tank (BLT) and a multi-hop assault system called 'Sarvatra'.[12]

Between 1987 and 1997, India's arms imports have fluctuated in current dollar terms but never decreased. The highest point was in 1988 when imports were worth USD 330 mn and the lowest was in 1992 with USD 75 mn, a huge downfall from 1991's USD 1000 mn. In 1993 it was 390 mn, and in 1994 USD 200 mn.[13]

The nature of products, and delays in completion of the projects have lead India to search for markets. Despite the fall of Soviet Union, the main weapons supplier for India remains Russia and the newly independent CARs. Discussions continued through most of 1990s for purchase of an aircraft carrier from Russia and Advanced Jet Trainers from Britain. The USD 2.3 bn Gorshkov aircraft deal will materialise soon. India has also signed purchase of 28 MiG-29 K aircraft, to be on board Gorshkov. USD 1.5 bn has been earmarked for purchase of much-needed Advanced Jet Trainers.

India has been reportedly exploring partnership ventures between HAL and Russia's illyshin Design Bureau and Irkusk Aviation production Organisation for development and production of a main medium transport aircraft. IAF has indicated the

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[12] John Cheriyan *The Arms Bazar* Chennai: Frontline April 26, 2002, pp 67-71

[13] Anthony Cordesman, n 7

need for 35 such aircraft. [14] India's biggest ever defence deal for Su-30 MKIs was discussed around 1999 and finalised a year later.

Despite continuing defence ties with Russia, the much-needed diversification of markets is underway. Apart from Russia, who for decades have been the main suppliers, Israel, France and South Africa, Britain and US are keen to sell hardware to India. American supplies cleared so far include the weapons-locating radars and spares for Navy's Sea King helicopters. Delhi plans to buy weapons from US. An agreement for selling eight Raytheon AN/TPQ-37 fire-finder Weapons Locating Radar has been reached. Also, the sale of engines and avionics for the long-delayed LCA has been cleared by US. South Africa is eager to sell 300 G-6 self-propelled guns worth USD 1.5 bn, even as Swedish company SWS Defence hope India will opt for the latest Bofors Howitzers. The deal, if materialised, will cost USD 1 bn, for more than 3000 Bofors. Army has in fact been requesting for more guns. Meanwhile, both South Africans and Swedes have expressed desire to invest in the upcoming ordnance factory at Nalanda.

Post-Kargil, a lot of equipment was bought from Israel, including AWACS, anti radar systems and fly-by-wire technology. In late 1990s, Israel supplied India with USD 80 mn worth electronic warfare systems for the MiG-21 Bis. But the USD 1 bn Phalcon deal awaits final clearance from US.

In joint ventures, India has collaborated in producing the BrahMos Supersonic anti-ship cruise missile, which can carry 300 kg warhead, at 300 kms range. The Russians are also keen to sell two Amur class submarines. According to the defence Ministry Annual report 1999, contracts have been placed for medium-range surveillance radars and thermal integrated observation equipment. [15]

5.4 Participation with Private Industry and use of COTs:

In the rapidly expanding military technology environment, government's R and D and manufacturing facilities alone will not be adequate to meet the total requirements of

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[14] John Cheriyan n 12

[15] . *Annual report* New Delhi: Ministry of Defence, 1999 p 20

the defence establishments. As we have seen, imports continue to dominate defence procurements, in value and volumes.

Meanwhile, private industry, which could not participate in defence production in much of the 1990s, grew in size and reach and acquired modern manufacturing capabilities and is competing with Ordnance factories and Defence PSUs to play a role in national defence. In fact, the percentage of commercial technology used in military systems is increasing rapidly. The speedy changes in the communication field reversed the trend of 'civil world getting benefited from defence technologies to military being made to follow the civilian technologies'. The tremendous growth in communication and computing coupled with the end of Cold War have lead to a new thinking which is inclined to accept Commercial-off-the-shelf technologies (COTs) wherever possible in the military operations scenario.

In the late 90s, it was realised that the private sector merits a role in the national defence, definitely in non-lethal items like communications and IT-related equipment. Technological developments in the decade, disruption in military imports, and concerted efforts by developed countries to impose sanctions on technology transfers has highlighted the need for self-reliance. The way forward was to involve the industry in select defence technologies and manufacturing, in a manner very different from what the services were used to till then.[16]

The Indian private industry, especially in the IT sector is well known all over the world as a leader and is a natural partner for the defence services. The participation of Indian IT industry for the development of the proposed Tactical C3I system is essential. It will also reduce reliance on foreign vendors and will make the country less vulnerable.

The army needs the co-operation from private industry on products (software, hardware, network, communications etc), technologies (web, network, encryption, DBMS etc), consultancy, (system analysis, policies), as also Research and Development

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[16] V P Malik *Military Communications: Role of Industry*, keynote address deliverd at the Army-CII seminar on 'Military Communications: Roll of Indiustry, New Delhi, 1999 at www.ciidefence.com

(operating systems, GIS, satellite imagery, encryption etc). In fact, the private industry has excellent business opportunities in the field of radios of all types, ATM switches, optical fibre cable, satellite systems, power sources like dry and secondary batteries of the latest technology, charging and generating sets along with UPS systems. In the field of IT, LANs and WANs and associated devices can generate business.

In June 1998, intense deliberations were held on the topic of 'The Defence Sector: a Public-Private partnership for Designing, Development and Production' which discussed partnership prospects. After this the defence ministry opened up eight laboratories to the private sector and six task forces were set up, to prioritise areas of further collaboration.[17]

The main recommendations given by these task forces are as follows:

- Establish a three-tier organisational structure for the management of IT at individual service, MOD and national level

- Inter-departmental core group of representatives from MoD, Defence finance, defence production and supplies and defence services to evolve fast track procedures for speedy implementation of defence-IT projects

- Setting up of a defence-IT council as an apex body, with representatives from the MoD, DRDO, Defence services and academia to recommend and monitor priority development of security–sensitive root technologies and systems; facilitate implementation of IT road map 2008 for the three services, give inputs to the cabinet committee on information technology or any other national IT body when formed, as also establishing a defence IT Project Group and Defence IT project Board for approval and sanction of defence IT projects upto Rs 29 cores and Rs 50 crores respectively

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[17] These details are based on the reports on the following seminars: *Military Communications: Role of Industry,* 10-11 August, 2000, New Delhi: Chamber of Indian Industries; *National Seminar on Indeginisation,* New Delhi: Air Force Auditorium, 7-8 September 2000, both available on the Internet site of ciidefence.com

- Establish a defence information infrastructure security agency and urge the government to enhance the scope of civil defence recovery measures and to establish a national Information Security Agency

- Set up joint core working groups to address issues like formulation of a framework for adoption of COTS technology in defence applications, define IT standards for COTS and military applications, evolve guidelines for preparation of request for proposal for products and services, work out modalities for creation of zonal tool rooms, work out methodologies for awarding vendor rating in the core areas of IT, formulate guidelines for adoption of basic standards pertaining to information systems security, audit, certification and related issues, and rough out a comprehensive roadmap for training needs of service institutions in joint partnership with industry

- Each service and MoD should prepare their respective IT Road Map 2008 and disseminate shareable information with the industry.

- National industrial bodies like CII should prepare a directory of IT vendors in various fields and disseminate the same to the defence services. The directory format should include details such as major projects undertaken, turnover, R and D infrastructure and planned investments in these fields.

- A suitable organisation should be constituted to establish architecture for knowledge management in the defence services.

The task force gave reports in August 1999, and on the basis of a review meeting with CII, Defence Ministry decided to implement the recommendations on a few projects. A detailed plan of action was drawn up in respect of IT and Communication and Components and materials. The projects approved as 'test cases' were shipbuilding steel plates and structural sections, Heavy duty corrosion, abrasion resistance coatings for marine applications, passive components like resistors, capacitors, potentiometers, driving and firing simulators.

It is not practical to address the needs from within, when RMA technologies consist of COTs. With India's strength in software it makes sense to buy and collaborate with industry. Army has recommended that project implementation be decentralised,

projects upto Rs 10 mn cleared by the army itself and employ local industry's help to develop software and wherever available, purchase software off-the-shelf.

The armed forces have realised the need to pool technology in areas like resources, equipment systems, networks and people who can handle information dominance. It has started the process of networking with the industry and establishing a binding relationship, for which the defence ministry has started the 'Confederation of Indian Industry- Armed Forces Information technology Task Force.' Software, instead of hardware is increasingly critical to value addition in related industries. With industry standards becoming universal, the market entry and innovation of products will be faster. Global competition and ease of transitional communications have lead to products, architecture and infrastructure develop with increasing speed and better quality.

Like the Army, the Indian Air Force has also held deliberations with the industry on its help for indigenisation. In a recent national seminar on indiginisaiton, areas were identified that could be opened up for the industry and other aspects relating to quality assurance, type certification, utilisation of DRDO facilities etc were discussed. In the IAF's indigenisation drive, all efforts have been put to remove bottlenecks. But admittedly, whatever has been indiginised constitute low-value items which require simple technology. But the requirements are for medium and high technology items, which are often expensive. They are not required in large numbers and therefore would not justify commercial viability for the private industry. While aeroplanes have changed little in the last decade and a half, the C4I system and avionics have seen revolutionary change, because of the exponential increments in the speed of processing. In 1980, the four-bit processor and 64K random access memory was enviable. Today, processor speeds have increased over 100 percent than what it was around 15 years ago.

Industry can meet defence production requirements. Most defence PSUs and ordnance factories sublet their production requirements to subcontractors, mainly in small and medium scale industrial units. Strong suggestions have been made to transfer clothing, equipment and general stores from defence PSUs to small and medium scale industry. Once a degree of confidence is achieved, industry may be permitted to produce armament and ammunition.

There is no substantial commitment in India's older, more traditional defence industries to end insulation with private sector. Defence PSUs need to achieve greater efficiency to compete in the private sector in the liberalised environment. They may produce some sophisticated systems successfully. After liberalisation, it has become possible to have productive interface between the two sectors. Strategic industries like minerals, minerals, metals, electronics, engineering, transport, chemicals and power are relevant for dual use technologies. But overall, the substantial part of Indian defence production will remain with public sector because the demand will be insufficient to justify development and production in private sector.[18]

The first major opening up of defence hardware was in the area of military communications. A national Telecom Policy was formulated in 1994 to attract the private sector to augment the state-owned Department of Telecommunications' efforts in providing a telecommunication network throughout the country. Later, taking the advent of Internet into account, another draft NTP was put forward in 1999, and finalised. In 2002, government opened defence industry for 100 percent Indian private sector participation, with foreign direct investment.

While it is well and good to have COTS, the armed forces will have to ensure that it complies with various testing and evaluation methods. But analysts find that advantages of adopting COTs is the reduced time cycle as also the overall reduction in time for quality assurance activities. While the onus of indigenous development of items mainly lies with MoD, the process of indigenisation suffers setback due to lack of transparency on part of the vendors. Often, the vendors are seen to select items that are beyond their production range and in-house capacity. They fail sometimes to appreciate qualitative requirements of the aviation class components before accepting an item, which affects delivery schedule and cost overrun.[19]

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[18] Sandy Gordon, n 6 p 348-349

[19] Ramesh Khosla, 'An Approach to Reliability: Commercial-off-the-Shelf Military Communication Systems, paper presented at seminar on military communications: Role of Industry, 10-11 August, 2000, New Delhi available at website www.ciidefence.com

Conclusion

The above discussion was aimed at analysing Indian armed forces on the basis of the latest technological innovations in the field of information technology, which also had great impact on the way war was perceived and conducted. The following conclusions have been found after the analysis of the inventories, organisation, and financial issues of the armed forces.

The requirements of military modernisation are determined by the three factors namely emerging national security situation, technological capabilities of the nation and availability of funds. In the 1990s Indian armed forces faced crises in technological self reliance and availability of funds, while the country faced new challenges to its security and territorial integrity through insurgencies and cross-border terrorism. After the end of Cold War, there were global changes in the way militaries looked at warfare.

These changes were brought about by emerging societal patterns, innovations in technology and the global security scenario. These changes affected militaries globally creating what later came to be called a Revolution in Military Affairs (RMA), a new paradigm in methods, means, technologies and operational concepts of warfare, based on the application of information technologies. IT-oriented RMA changed both the technological aspects of military doctrines, operational concepts, force levels, weapons and modes of warfare.

In the 1990's, India faced threats primarily emerging from the insurgencies and cross-border terrorism and the need to protect the borders, which are largely unresolved. The military modernisation programme of the Chinese armed forces and its supply of arms to Pakistan are threats which India would have to take into consideration when modernising its forces. Pakistan meanwhile fuelled a proxy-war through cross-border terrorism and developed a strong military industrial complex and continued to modernise its forces, largely through purchase of military hardware from foreign sources. There is a long-term and indirect threat from the presence of US and its direct or indirect supply of arms to countries in the region. The security threat posed by people working against the

sovereignty of the nation for either secession or for 'bleeding India in a thousand places' is most important for Indian armed forces. These elements often get refuge and funds and in some cases training and military hardware from hostile neighbours. This increases the importance of armed forces in handling low intensity conflicts. The need to protect India's energy assets and information networks and check the proliferation of small weapons, narcotics were areas of concern. Monitoring the borders and the sea were crucial in preserving India's territorial integrity and resources.

The army, though not used to handling issues which should ideally be handled by police and paramilitary forces, cannot shy away from problems of the fissiparous movements, as this has relevance to armed forces' basic role of preserving India's sovereignty and territorial integrity. But with the new technologies being made easily available to state and non-state actors, a different set of skills and organisation is required of the army to face the new challenges. While the emphasis is on high-tech lean and mechanised forces, India's threat perception requires capital-intensive armed forces.

With the current inventory, most of the threats can be managed. But the problem is not in the military hardware alone, but in how the available technology is used in organising the armed forces in such a way that the most effective solutions are found by the innovative application of technologies on the battleground. India has a large military and changes in modernisation will require large-scale application, which again will delay the reach of military innovations to all parts of the armed forces. Threats are adequately and less expensively managed through a manpower-intensive force than through high technology. A capital-intensive military, with a nuclear capability and relative absence of multiple external threats suggests that the current structure is adequate. For India lower tech, man-power-intensive forces also form the basis for dealing with primary clashes, viz, internal threats of terrorism, insurgency, separatism, possibly aided by external players.

The process of Indian armed forces modernisation faced a virtual standstill after the collapse of its main military supplier, the Soviet Union. The shock was compounded by the humilitating defeat faced by the Indian Peace Keeping Forces in Sri Lanka, who returned in 1990. Since then, modernisation has not been steady or top priority for fragile governments that ruled the ten years under review. But things began to show changes towards the end of the decade. The BJP-led government has successfully carried out nuclear tests and embarked on a programme of modernisation. But much of this modernisation was again based on purchase, local upgrades than innovations at home. At the end of the decade, a conflict with Pakistan has thrown open chinks in the armour for the world's fourth largest army. The Kargil war highlighted the rationale of limited wars, a result of economic and political consideration as also fear of nuclear flare-up, high casualties and international pressure. Low intensity or limited warfare is characterised by limitation on its conduct and space: limited in time, geographical area and force level. Concepts of RMA have to occur within the constraints and doctrines of limited war. Kargil war showed that if the threats remain what they are, with the current force levels and equipment, India is capable of acting effectively, as it did in Kargil, which also showed India's potential in co-ordinating air power and ground forces.

An analysis of the three services of Indian armed forces leads to the following observations: There is a need to reduce manpower, and increase lethality of forces. This could be done by reorganising mechanised forces, combat arms and supporting services on task-specific lines; reducing mount divisions and progressive suppression of field forces. It is possible to reduce up to 200,000 personnel over a decade. The army's initiative to end field force of 50,000 people to make available Rs 600 crore for modernisation could be applied by other services also.

Given the importance of counterinsurgency operations in security, armed forces have to be trained in dealing with an asymmetric threat. Meanwhile it was noted that raising a force specially trained force for counter-insurgency operations, which could also provide rear area security during war is needed, can gradually help army go back to its primary function of guarding the nation's borders and preserving its sovereignty.

Counter-insurgency assignments should soon go back to police and paramilitary organisations.

Information technology penetration of the armed forces is essential in making the best use of the emerging technologies and applications in warfare. While Indian armed forces are emphasising computer literacy, it is having difficulties in recruiting, training, promoting and retaining technicians with RMA-related skills. Army has an Information Technology vision statement, Air Force has an Air Power Doctrine and the Navy has a plan for the future, all of which have pledged to incorporate the fallout of the new RMA.

On a doctrinal and organisational level, a strategic defence review, National Security Council and CDS are yet to take full shape. Though in place, the NSC is yet to become integral in decision making process. There has been criticism that NSC is a group of people drawn from different walks of life- soldiers, academics, journalists, bureaucrats, politicians- with different ideas on what constitutes security threats and how to deal with them. The role it played in decisionmaking is minimal. Mostly the Cabinet Committee on Security (CCS) has been taking decisions on critical times. On the issue of CDS, there was much debate, as it was hailed as a need for a nuclear nation to have proper command and control mechanism. But interservices rivalries have plagued the implementing of the CDS, which led the government to put it in cold storage for the time being. There is no strategic doctrine that spells out India's security threats, military goals and imperatives and the role it wants to play in the region in particular and in the world in general. The absence of a strategic doctrine has led to a lack of proper strategic thinking and advanced planning. The three services continue to maintain their own separate visions and doctrines. Tri-service doctrines will have to be evolved to specific security environment so that our operational plans can be designed.

Intelligence establishment needs improvements in tune with the requirements and the technological innovations in the field of information collection, dissemination and distribution. There is need to acquire more reconnaissance and surveillance equipment including aerial reconnaissance vehicles and ground sensor as well as geo-positioning systems, which are areas India lacks in.

In analysing the inventory modernisation of all three services, it was concluded that there was no pursuit of revolutionary increases. A perception remains that there is no predictable threat that India cannot match with its planned acquisitions and force posture. Innovative technological solutions are considered expensive, not perceived as necessary, and against the grain of existing bureaucratic and organisational preferences. There is no vision of military reform, much less revolution. All three services give emphasis on overhauling and improving existing platforms and buying spares for local upgrades rather than spending money and time on research and development. But often the purchase of systems from abroad leads to maintenance problems. It is seen that the purchases are often made for outdated and worn out weapons and platforms. The technology becomes obsolete before it is completely incorporated into the armed forces. This further necessitates more purchases.

Meanwhile, local production has suffered immensely because of lack of funds, and delays, labour issues as also assembly problems. The examples are Arjun Main Battle Tank, Light Combat Aircraft, Pinaka multi-barrel rocket launcher system. India's Integrated Guided Missile Development Programme also suffered major delays because of technology control regimes and funding troubles. Much of India's ship building also suffered for the same reasons, though Navy has been able to incorporate foreign designs in local manufacturing procedures. The Air Force largely remains a 'buyer service' with almost all its inventory- platforms and weapons- coming from abroad. A large number of airforce fleet are of Russian origin and much of it has expired their use, but are still in service. This contributed to high accident rates. Local overhaul of MiG fighter aircraft remains a problem, due to lack of availability of spare parts and assembly problems. An advanced jet trainer could not be developed locally, and decisions are yet to be made on buying it from aborad.

Indian national security policy demonstrates continuity with tradition rather than a new vision of military affairs. A host of issues remain to be addressed properly like

capabilities in C4ISR (Command, Control, Computers, Communications, Intelligence, Surveillance and Reconnaissance and force multipliers. India is in dire need of force multipliers like weapon locating radars, night vision devices for the army, surveillance aircraft for the navy, aerial early warning systems, unmanned aerial vehicles, aerial refuelling for air force. India's information warfare capabilities are not very impressive, despite being a potential information technology superpower.

While India has started integrating new capabilities, like use and production of Unmanned Aerial Vehicles, it is unclear if it has either the inclination or requirement of significant levels of innovation. More home-built missiles on exiting platforms, greater mobility, computerisation of management and training, better tri-service integration, war-fighting doctrine, improved electronic warfare capabilities are issues that need attention.

New defence relations with countries like Israel and US will be significant, as India needs to diversify its arms market and escape from the various technology control regimes. This has been necessitated by the fatigue and lack of readiness faced by Indian armed forces for the larger part of 1990s due to the absence of key military supplier and the draining of spare-part markets. For India, the ratio of high technology assets to ordinary delivery platforms would remain low for years. Stretching the operational life cycle of existing weapon systems through mid-life upgrade provides incremental modernisation at far lower and affordable costs. The complacency due to licence-production has affected the development of design and production capabilities.

Any medium-term plan of modernisation of armed forces may involve an additional burden of Rs 3,000 crore to Rs 4000 crore. If GDP growth is sustained at 6 per cent to 7 per cent, this order of expenditure can be sustained without serious impact on fiscal management. More than increasing the share of defence expenditure in national income, India's priority should be to restructure such spending towards modernisation of the armed forces and their infrastructure support services.

An analysis of the defence budget trends reveals that India's defence cuts are neither substantial nor deep but seem to be designed to maintain basic fabric of the force structure so that resources permitting; modernisation will continue. A strategy of modernisation that depends on force multipliers and retrofitting will help the current Indian inventory and force structures. India with its under-equipped modern platforms can gain by weapons and systems refits achievable through indigenous technology, taking help from the private industry. But it is unlikely that the modernisation of 80's (aimed at overall growth) will be repeated.

But India's large fighting forces are inefficient by West's standards. This realisation should lead to effective expansion of capabilities at minimum cost. Modernisation will continue because the budgeting patterns do not indicate a substantial reassessment of India's strategic circumstances such that military modernisation would be taken off India's agenda.

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