REVOLUTION IN MILITARY AFFAIRS IN NON-WESTERN STATES: COMPARING CHINA AND INDIA

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DECLARATION

I declare that the dissertation entitled "Revolution in Military Affairs in Non-Western States: Comparing China and India" submitted by me in partial fulfilment of the requirements for the degree of **Master of Philosophy** of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any other degree of this university or any other university.

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CERTIFICATE

We recommend that this dissertation be place before the examiners for evaluation.

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Dedicated to my parents.

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CONTENTS

ABBREVIATIONS

AWACS: Airborne Warning and Control System.

BAT: Brilliant Anti Tank.

C^4I: Command, Control, Communications, Computers and Intelligence.

C^4I^2: Command, Control, Communications, Computers, Intelligence and Interoperability.

C^4I^2SR: Command, Control, Communications, Computers, Intelligence, Information, Surveillance and Reconnaissance.

CAS: Close Air Support.

COSTIND: Commission Of Science, Technology and Industry for National Defence.

DRDO: Defence Research and Development Organisation.

EMP: Electro Magnetic Pulse.

GAD: General Armaments Department.

GPS: Global Positioning System.

HARM: High speed Anti Radiation Missiles.

ICBM: Inter Continental Ballistic Missile.

IRBM: Intermediate Range Ballistic Missiles.

IT: Information Technology.

IW: Information Warfare.

JDAMS: Joint Direct Attack Munitions.

JSTARS: Joint Surveillance and Target Attack Radar System.

JTIDS: Joint Tactical Information Distribution System.

LCAC: Landing Craft Air Cushion.

LIC: Low Intensity Conflict.

LIDAR: Light Detection and Ranging.

MINDEF: Ministry of Defence (of Singapore).

MOD: Ministry Of Defence.

MoU: Memorandum of Understanding.

MTCR: Missile Technology Control Regime.

MTR: Military Technical Revolution

NDP: National Defence Panel.

NIC: National Intelligence Council.

NSG: Nuclear Suppliers Group.

OAS: Offensive Air Support.

PLA: People's Liberation Army.

R&D: Research & Development.

RMA: Revolution in Military Affairs.

RPV: Remotely Piloted Vehicle.

TMD: Theatre Missile Defence.

UAV: Unmanned Aerial Vehicles.

WAN: Wide Area Network.

WMD: Weapons of Mass Destruction.

WWMCCS: Worldwide Military Command and Control System.

Chapter I

INTRODUCTION

The nature of warfare has taken a profound shift from the conventional warfare methods to new methods of warfare. The twenty first century has witnessed a revolution in military affairs. The objective of this study is the viability of contemporary revolution in military affairs in the non-western states. A notable change in the methods of warfare which can revolutionise the warfare scenario is called as the Revolution in Military Affairs (RMA). The contemporary RMA includes means of conducting war which were not considered before. Quick retaliation with effective weapons is the main advantage of the ongoing revolution in military affairs. The method of warfare in the present age is driven by the excellent application of technological superiority in military science. The traditional warfare methods are evident in the confrontation of large armies and the conflict behind the lines. In contemporary warfare, there are no mass armies and no direct confrontation; the strategy is aimed at the enemy's information interceptors even before they can realise.

Revolution in Military Affairs (RMA) is one of the major axis on which the modern day developments in military forces revolve. RMA can be defined as the shift in the doctrine and organisational structure of a military establishment. All the components like doctrine, organisational structure and technologies which are involved in the making of a RMA, occupy equal position in the development of a RMA. The advent and the spread of information technologies have changed the methods of waging a war. Technologies like micro electronics, sensors, computers, telecommunications and data processing systems have changed warfare tactics. The incorporation of these technologies can be seen in the form of rapid transformation of intelligence and location of enemy targets, deployment of new generation of lethal and accurate precision guided munitions, continuous twenty four hour operations, improving the ability to engage in deep strikes, better control of information flows and development of the ability to deny information to the enemy. The application of these new technologies in a significant number of concepts and organisational adaptation in a way fundamentally alters the character and conduct of a conflict. It

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does so by producing a dramatic increase in combat potential and military effectiveness of the armed forces (Jonathan: 1981).

The last century has witnessed three major military revolutions and the last among these have crept into the twenty first century, dominating the military centre stage now. The three military revolutions are as follows: a) mechanised warfare in the 1930's and 1940's, b) nuclear weapons and ballistic missiles in the 1950's and 1960's and c) warfare driven by information technology in 1970's.

This third revolution in military affairs took shape in the 1970's as Revolution in Military Technical Affairs (RMTA) in Russia. The United States developed the RMA on the lines of the Russian RMTA. The technological infusion into weapons production has been named as the RMA because it is a radical shift from the way ammunitions were manufactured hitherto. RMA is a deviation from the usual way of conducting war. The Gulf Wars of the 1990's is considered by the RMA proponents as the demonstration of the RMA weapons capabilities.

Innovative technologies in military sphere can be considered as a survival tactic. This defines the space between the countries in military superiority. The state which has good Research and Development (R&D) capabilities will stand ahead in terms of military superiority also. The threat perceptions from a state depend on the intentions emanating from that state and from the military capabilities of that state. The present century's threat perception is very different from the traditional threat perceptions. Till the 1990's, the major players were the United States and the Soviet Union; with the collapse of the Soviet Union, the world security scenario has changed. In the present century, the states with advanced military capabilities have increased in number and their character has also undergone a major change from the traditional players. The present revolution in military affairs has made the states to realise that the twenty first century war is different from the ones which have been waged before. The Gulf Wars have left the states in a bewildered situation. The nature of war has changed in certain ways as now the wars are mostly directed at the so called 'axis of evil'; the war is a unilateral effort and the players, spoils of war and character of weapons have taken a dramatic shift. The first mission of the coalition forces in the Gulf Wars was to paralyse the information infrastructure of the enemy

and thus to cripple them. The guided bombs and the High-speed Anti Radiation Missiles (HARM) left the war analysts and observers astounded.

The reality which heralded the RMA has settled well within the military circles of most of the states. Some states have started responding by participating in country specific RMA programmes. The less developed states that have low military resources for the new RMA have started responding by initiating the development of a hybrid RMA. With all these developments taking place, the superiority of the United States in the RMA has been predicted until 2030. By 2030, either regional and transnational military cooperation and understandings or the rise of a peer competitor is assumed to take a significant turn in international relations. But all that has to flow from the present RMA. The present revolution in military affairs is considered an epoch in the military studies.

This study aims to analyse the emergence and the efficacy of RMA in the non-western states. RMA has changed the way the world has been viewing the warfare scenario. The reasons for the present revolution in military affairs may be attributed to various factors like development of technology, communication and innovative military research. The emergence of certain technically developed states with innovative warfare capabilities beyond the reach of most of the other states is becoming a concern for security analysts worldwide. The states with fewer resources to dedicate to the development of RMA capable weapons would start investing in indigenous RMA. This study aspires to examine the warfare tactics being pursued by states other than the western states as a countermeasure to the RMA. The study gains relevance as the threat perceptions can be traced to the emergence of RMA.

The ongoing revolution in military affairs has started taking shape from the last three decades. The capabilities of the ongoing revolution in military affairs and the scepticism regarding this have been emanated from various academic quarters. Essays and opinions on 'smart bombs', Precision Guided Munitions (PGMs) and RMA as a technologically driven force has found expressions in the military academics for some time now. A view on RMA and the changing security affairs, which is the view of RMA through the socio-political lens, has also been initiated. The Literature which focuses on the RMA of specific states is also available. The states which are focused more on this segment are those states which are considered

as a threat to the United States superiority. RMA is also being regarded as a political, cultural and organisational concept. This could be one reason why vast literature is being produced on force modernisation of countries.

As the title suggests, RMA is a remarkable or revolutionary change in the ongoing system of affairs in the military scene. The remarkable shift in the warfare tactics alone is not what makes a revolution in military affairs. Contemporary RMA includes structural and organisational change as well. Revolution in military affairs is a wide concept with far reaching effects. There is no commonly accepted definition for the RMA. Many scholars define the current RMA in their own terms. As said before, RMA is also considered country specific and therefore the definition could vary. One way of defining the revolution in military affairs is as the 'emerging defence capabilities' of a state. Revolutionary changes in military affairs have been witnessed for ages but the new age revolution is quoted as the reformation of the industrial age forces to a highly lethal and deployable force for the future. This lethal and deployable force has been seen in action in Afghanistan, NATO bombardment of Kosovo and Gulf Wars.

The remarkable revolution in military affairs in the twenty first century can be classified into three categories. This study focuses on the third aspect *i.e.* information technology infused warfare techniques, the evolution of which started from the 1970's. The idea of RMTA evolved as the Soviet Union's Chief of Staff Nikolai Ogarkov's central point that a third new revolution in military technical affairs has begun which would replace traditional weapons with electronic components, information systems, third generation nuclear weapons and aero-space dominion. The 1991 Gulf Wars demonstrated this idea which manifested in the use of air fuelling, PGMs and HARM. There is another view that the Gulf War cannot be considered as a total information war. This view has been expressed by O'Hanlon in his 'Technological Change and the Future of Warfare'. The Gulf War is considered as a hybrid version of traditional warfare and information warfare tactics (O'Hanlon 2000). The basic components that constitute the present RMA are as follows:

a) The advent and advances made in the field of computers have made a huge difference. Speed and technological improvements could be observed and the infusion of computers into the military scenario has swiftly changed the methods of conducting

war. Till 1940's, the Pentagon was the largest customer of companies producing computers. The availability of computers at cheap prices has made the army immensely powerful in a short span of time. The synergistic combination of these factors has led to smooth network communications, dissemination and analysis of data which in turn has led to the effectiveness of military forces activities.

b) Coordination of defence forces gained importance as a necessary component of RMA. When the sharing of information became vital for the successful operation of the military exercises, the boundaries between services within the military had to take a back seat. A joint service operation is another basic component of the present RMA and the distinguishing factor is the information interception. Information interception of the enemy camp and disruption of the intercepted information or else information dominance is the present warfare strategy (Tilford 1995).

RMA is a relevant theme in today's world regarding military progress and shifting security dynamics. There are proponents for RMA and against RMA. The major views on RMA have been categorised into four schools of thought. The first school is the 'system of systems' school of thought. This school of thought can be called the blue print of the United States military programme. This school is also regarded as the skeleton of the RMA. The improvement and the synergistic combination of the C^4I (Command, Control, Communication, Computer and Intelligence) and joint service operations leading to effective operations are the central view point of this school. This school of thought which became very popular in the United States and ambitious was popularised by Admiral William Owens in the 1990's. The second school of thought known as the 'dominant battle space knowledge' school of thought revolves around the premise of a transparent battle space in the future. They argue that the dominance in battle space can be gained through the radical improvements in the capabilities of sensors. This school of thought is considered by analysts as much more ambitious than the system of systems school of thought. Analysts are of the opinion that rendering the battle space transparent is not possible because the enemy would definitely develop countermeasures to avoid detection and surveillance. They argue that chaos is an integral part of the battle space. With technological improvements like the Global Positioning Systems (GPS), Unmanned Aerial Vehicles (UAV's) and other

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information capabilities more accuracy in the information from the battlefield can be achieved but a transparent battlefield is not possible.

The 'global reach, global power' is the third school of thought of the RMA. As the name suggests, the school's proponents envisages rapid and swift military strikes from the United States to other states. Their imagination of future weapons capabilities envisage intercontinental artillery, space based weapons and energy weapons. This school is more ambitious in the view of analysts as compared other schools of thought. The fourth school of thought has a different view from the other schools. This school is known as the 'vulnerability' school of thought. The extreme optimism of the other three schools is the motivation for this school of thought. The substance of the argument of the vulnerability school is about the growing threats arising because of the RMA. This school highlights the challenges that will have to be faced as a consequence of technological diffusion and proliferation to other countries. There are other schools of thought in RMA which elaborate works on the first three schools of thought as they form the main concepts of the contemporary RMA (O'Hanlon 2000).

RMA is not only technological superiority. Common observers tend to believe that RMA is a by-product of technological innovation. This is probably true but RMA also has a lot to do with the organisational culture and policies of military administration. In the case of Soviet Union, the brilliant forecast of the future warfare collapsed not only because of the unavailability of the funds but also because of lack of political will, obstruction from within the army and lack of reformation spirit. Political-strategic implications, budget and social organisation along with technological lead is what constitutes a RMA (Arquilla and Ronfeldt 1997).

The battlefield tactics will always be subjected to change as it is directly linked to the superiority of states in the battlefield. This factor compels the state to make significant innovations so as to manoeuvre its way among the adversaries. The United States is the most advanced state today owing to the advances in the information communication technologies which is evident in their use. The combination of the United States as the best defence force and as technologically advanced state would enable the United States to progress in pursuing RMA. In other

words, RMA can also be viewed as the derivative of the United States' political and defence identity.

The threat perception has resulted in a paradigm shift with the wars being directed at the so called 'axis of evil' states. The wars of this century have changed into unilateral campaigns which pose a threat to the militarily less developed countries. This signifies the change in the nature of conflict. The globalisation of threat and security and changes in the geo-strategic concerns has changed the politics of conflicts. The security scenario has changed; the infusions of various non state actors have also added to this changing scenario. The non-state actors which hold radically opposite ideologies than the state have been able to change the security scenario of the states by posing as a threat to the stability of the state. With the RMA as a precious treasure that the United States is unwilling to share, its coalition with other states in military campaigns will suffer deeply. The other western states are now trying to develop niche capabilities otherwise they would become the victims of operational and political marginalisation (Sloan 2002). Most of the European states are also not interested in spending huge amounts in defence development as they are focusing on peaceful cooperation. The RMA creates misunderstanding amongst western states though there is no imminent threat from the RMA for the western states. This is because the advanced RMA of the US is creating an uncomfortable situation amongst other western states.

The present revolution in military affairs is expensive to pursue. Some perceive RMA as a revolution in security affairs. The RMA triggered by the United States has changed the perception of security for almost all politically conscious states. The need to revamp military strategies has started showing up with the advances of the US military forces. The US has shown that it can engage in almost any military pursuit it chooses. Afghanistan and Iraq bear testimony to this strategy of the US. Analysts are of the view that though the RMA would not be considered a threat by the US allies now, it could potentially generate differences among them in the future since France and Germany do not always concur with the opinion of the US (Morgan 2000). Other states pursuing RMA are the United Kingdom, Canada, Netherlands, Sweden, Australia, New Zealand, South Africa, Singapore, Republic of China, India, Russia and Germany.

In 2003, the Ministry of Defence (MINDEF) of Singapore started exploring the possibilities of a third generation Singapore Armed Forces. In the case of Singapore, analysts are of the view that this small country could be interested in RMA only as a force multiplier. Japan's and Sweden's attempts for RMA are seen in the larger view of their geo-strategic concerns. Sufficient literature exists on RMA in Russia. Though the RMA as a concept was initiated in Russia, the Russian forces are now undergoing a phase of modernisation of Russian armed forces in the process of progress. The Russian army is what Russia could salvage from the ruins of the Soviet Union and a closer scrutiny reveals the inherent deficiencies within the army structure. In the Asian region, China has undergone force modernisation on a large scale. Analysts are of the opinion that China could grow into a threat for the ambitions of the US in the Asia Pacific region. China is seen as an emerging state regarding military affair though difficulties have been encountered in the transformation of the Chinese army. Another important state in the Asian region is India which is also seen as a rising military power. In South Africa, analysts have detected traces of an indigenous RMA. The South African policy papers like the Defence Act of 2000, the Defence White Paper of 1996 and the Defence Review of 1998 outlines a framework for RMA (Pretorius: 2006). These papers underline the emergence of RMA which is in progress. Some other states which have opted for RMA are Taiwan and Australia.

The Gulf Wars have given a paradigm for the weapons which could be used in future wars. War has extended to a five dimensional war from a three dimensional one. Waging an RMA is a comparatively easy task than defending a RMA weapon. This is another point to be pondered. Most of the countries – that have been cited – have resorted to RMA weapons production for safety purposes. Most of these states also lack the financial resources or are interested in channelising their financial resources to other areas. Superiority in the military capabilities of certain states could turn out to be harmful to security of other states. Thus even with resource crunch, most of them would adopt a RMA programme though it could very well be an uncoordinated, unstructured and fragmented perspective.

The United States' pursuit of RMA could be a reason to delay the accession of a peer competitor. Some views are that it is a measure of the United States foreign policy that is aimed at consolidation of future potential resources. The responses to

the RMA could be quicker than expected as the rest of the world is undergoing an economic globalisation which will make most of the states economically independent to pursue their own military strategy. The other states would also be harbouring worries about their survivability as a state which could prompt them to pursue extra military capabilities (Shaw 2005).

This study focuses on RMA in the non-western states. RMA analysts have come up with the picture that contemporary RMA is only in its development phase. The most powerful critique is about the viability of the RMA. Michael O'Hanlon has shown that the RMA is not a revolution as such. While John Arquilla and David Ronfeldt are of the opinion that the electronic warfare would be decisive in their own right. Other views urge the need to undertake historical studies. The case of the less capable states and conflicts in the cyberspace along with the changes in security perception broadens the debate into human, ecological and economical considerations which are also part of the RMA debate.

The revolution in military affairs has been characterised by some analysts as a discontinuous process in the long sequence of military affairs. This study would rather focus on RMA not as a discontinuous process but as part of the same process with change in the character of that process. RMA is the name given for present changes in the military tactics which is just part of the long process of the revolution which has taken place in the military field. The revolutions which have taken place before have been named as nuclear and mechanised revolutions. The present RMA is a part of the continuous quest for an equipped military force similar to the western states. This is because there are many dimensions which are yet to be studied. Uncertainties about the growth and development of RMA persists inspite of the expertise in the field. RMA has occupied the centre stage in international relations after the Gulf Wars and states have innovated under compulsion. This is the same as RMA is adding pressure on security issues and this has resulted in the non-western states planning for countermeasures. RMA being expensive, states could either plan for specific RMA or other options like biological or chemical weapons. The choice for nuclear weapons is expensive and also time consuming. Therefore states could choose asymmetrical means which are comparatively easier to attain than RMA. RMA as a deterrence and defence strategy is very much integrated with the political motivation of the US.

The study seeks to address the following research questions:

a) What explains the emergence of RMA in non-western states?

b) What responses will RMA capability of the western states stimulate from its non-western counterparts?

The aim of the study is to test the following hypothesis:

a) The emergence of RMA in non-western states can be attributed to the diffusion of technology.

The study is about the status of RMA in the non-western states. The study will focus on the emergence and efficacy of RMA in non-western states. The method to be undertaken in the study is inductive in nature. The study seeks to develop a broader understanding of RMA in the non-western world especially the RMA in China and India. The United States does not face competition within the western states in RMA capabilities. At present, there is no state which can counter the advanced military capabilities of the United States. The strategic analysts and planners of the United States are concerned about the growth of potential qualities in other states for developing RMA capabilities. The rise of China and India as influential regional powers is cause of concern as these states also has sophisticated knowledge of the RMA. Their progressive growth strategy could enable them to acquire RMA capabilities. The military culture which is being fostered in China and India also suggests that these non-western states are trying to inculcate RMA into their military culture. Moreover, these are the major non-western states which can be considered to grow into military powers in the coming decades. Any study on the RMA in non-western states will have to acknowledge the potentials of both China and India. The study will rely on secondary sources.

The study has been organised into five chapters in which, the first and the fifth chapters are introduction and conclusion respectively. The second chapter will give an account of the contemporary RMA in the western states. The chapter titled 'RMA in the western states' tries to analyse RMA capability of the western states and its implication in non-western states. Chapter three titled 'the emergence of RMA in non-western states: comparing China and India' tries to explain the emergence of RMA in non-western states. The chapter analyses the influence and role of diffusion of technology and emergence of RMA. The third chapter titled 'the efficacy of RMA in non-western states: comparing China and India' is about the efficacy of the non-

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western RMA. A comparative analysis of the emergence and efficacy of RMA in China an India is also attempted in the second and third chapter. The final chapter gives the conclusions arrived at by the researcher.

Chapter II

RMA IN THE WESTERN STATES.

Revolutions in military affairs have been changing the face of the military history for ages. The contemporary changes in the military affairs are no exception and have resulted in the dramatic change of the warfare scene. There are of more than one opinion about the revolution in military affairs. One major view that exists is that the contemporary changes in the warfare are not of a revolutionary change while the opposite expression also exists. A study of the ongoing changes in the military operations leaves no doubt about the changing character of warfare. We will have to accept that a drastic change has occurred in the mode of conducting war. The change in warfare is also labelled by some analysts as the 'modern war', 'new war' and the 'American War'. There is sufficient literature on the new way of conducting war though works on the contemporary revolution in military affairs are inconclusive as contemporary RMA capabilities are not fully exploited.

Any work on the contemporary revolution in military affairs would not be complete without the mention of the western military capabilities acquired during the last two decades. The United States of America dominates the term 'western' in the twenty-first century military advances. When the western states with advanced military capabilities are taken as a whole, the United States dominates the other states as a military power. To analyse the western military prowess in the twenty-first century, an analysis of the military technology of the United States is necessary. This is so because most of the characteristics of the contemporary revolution in military affairs are identified with the military operations of the United States. With the rise of other states as economic powers of the world, the western pattern of revolution in military affairs is also being remodelled in other states, which in turn are creating cause for concern in the West. Any attempt to study the ongoing revolution in military affairs would have to begin with the revolution in military affairs of the west and in particular, of the United States though the United States comes under the purview of the term 'west'. The objective of this chapter on the revolution in military affairs is also to form a basis for the next two chapters. It is also designed to give an overview

on the contemporary changes happening in the military operations which is otherwise called as the RMA.

The revolution in military affairs, as the name suggests is a dramatic change – a change of magnitude, which has occurred in the chain of military history. This change is supposed to be outstanding or exceptional in the conduct of military operations. The very common notion about the current change in military affairs is that this change is more about technology. A very clear understanding of this phenomenon will convey that the change is not only in technology but also in organisational structure and in joint operations, which has been linked together successfully. The revolution in military affairs is a practical shift from how war has been conducted a decade ago.

The evolution of the contemporary RMA in the western states

RMA is a very elusive yet very much debated theme in the military circles today. It was in the early 1980's that the notion of a military technical revolution evolved in the Soviet Union. Some analysts have written that the idea of Military Technical Revolution (MTR) has been evolving since the 1960's and 1970's. The major reasons identified for the evolution of RMA are the post Second World War scenario, the political insecurities generated after the cold war era, the economic progress of the states, advancement in technology and their availability and political ambitions of superior military powers.

There is no single aspect of the revolution in military affairs, which can be called the pivotal point of RMA's evolution strategy. There exists many aspects, which have shaped the RMA and every aspect has a crucial role in the evolution of the RMA. The Second World War made the then prominent states rethink about their military strengths and strategies. Large amount of investments started to flow into the military after the Second World War as the western states realised the need for an effective military force. In the 1960's, the Russians developed weapons, missiles and radio electronic means on a large scale. Developments were also made in other weapons which were fundamental in the nature of combat. This caused the increased interest of the United States in the RMA and conventional weapons. The end of the cold war is another factor which has favoured the growth of RMA as it freed the

market from the heavy regulations in the procurement of arms in the international market.

Apart from the manifestation of the political motivations of the more affluent states, the economic progress also has manifested in the form of effective military growth. The transformation of military is parallel to the economic growth in most of the states. This can be noticed in the case of western as well as non-western states. With the end of the Second World War, communication technologies and information technologies improved very much in the western states. As said before, Cold War is another turning point in the evolution of the RMA as it was after the cold war that the world politics took a different turn. The United States policy of interventionism can be attributed to the advances in conventional military capabilities (Shaw 2005). The cold war has also been considered as an important break for the enhancement of the military capability of the United States as it is during this period that they gathered the resources which were purportedly deployed in the Gulf wars. The cold war procurement policies[1] have been instrumental in this (Cohen 1996).

The inferior status awarded to the Soviet Union through the Warsaw pact was also identified as a cause for the widespread RMA of the twenty-first century as it gave the impetus to the Soviet Union to create asymmetries in force designs, which could give it the overall appearance of a strengthened military force. For this, the Soviet military had initiated the process of developing superior military and rapid mobilisation systems. These purposeful activities were aimed at controlling the Eastern Europe and to offset the American strategic power.

Technology has a lead role to play in the contemporary revolution in military affairs. The adaptation of civilian technology like the railroad and the telegraph into the military has helped the effectiveness of the military actions (Cohen 1996). The contemporary RMA's origins can be traced back to the ongoing information revolution. The military organisations has benefited in large by the information revolution. The advances made in the realm of computers and telecommunications has made mass data transmission and processing an easy task. The development of intelligent weapons with self guidance and precision is another by-product of the fusion of technology with military sciences. Technology has always been identified

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[1] After the cold war, the states realised that they needed more arms for future military operations. Thus policies were adopted by the western states to amass weapons. The United States also adopted such policies.

with the United States military though it claimed more significance in the second half of the twentieth century. The combination of the technological edge and outstanding military force made the state a fine military force. In the period after the Second World War, more emphasis was directed at the quality of the weapons used in warfare. The transformation in warfare process has come a long way starting from Vietnam. The *Operation Desert Storm* in 1991 has been a much discussed campaign of the United States led coalition for their radical deviation from the conventional warfare tactics and in fact this operation is dubbed as the harbinger of contemporary RMA. With the type of advanced weaponry used in this war, this can be said to be a high tech campaign. The military prowess of a state is said to be the demonstration of a state's political power and for this power to be intact, the state will have to undergo constant innovation in military to keep up the edge in warfare. The present phase in the American military sphere is compared by many war analysts to the 1920's and 1930's as they find the potential for more revolutionary changes in military affairs in the years to come.

The improvements in the military of the United States have not been matched with that of any other states so far. This could be considered one reason as to why there is no parallel state to compete the United States in military affairs. The improvements could be traced to the progress economic affairs of the state. Though there are other states, which has benefited with the rise in economic activity, they have not been able to invest as the United States or else they have invested in a different military doctrine. One such country is the Republic of China. The economic progress of China is being translated into short-range projection capability. In case of the western states like France and Britain, the focus is on long- range projection capability.

History of Revolutions in Military Affairs

Historic studies on the evolution of RMA point to technological breakthroughs as one of the major causes, which in turn have lead to organisational redesign and changes in doctrines. Sometimes RMA's have taken a long period to evolve. Multiple causes have been identified for the evolution of RMA's. Military historians have also singled out RMA's, which has been the cause of single technological innovation; some RMA's have been a result of organisational restructuring and some others have

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been introduced with the linking in the military technologies. Changes of intense nature are not new in the military history. These changes, which are intense in nature or those changes, which are capable of bringing in an improvement in the mode of conducting warfare, are called revolution in military affairs. Some analysts like to call RMA as a pragmatic shift in the conduct of military operations, which create core competencies and new dimensions of warfare while, another view on the RMA is that it is a fundamental change, which can recast the society, state and the military organisation.

The contemporary revolution in military affairs has been taking shape since the 1980's. It is a difficult task to point out revolutions in military affairs. This is because different analysts have come up with varying chronology of revolutions in military affairs. As revolutions in military affairs, reference can be made of infantry revolution, artillery revolution, naval warfare and Napoleonic warfare. The twentieth century revolution in military affairs includes aviation revolution and nuclear technology (Black 2005). Andrew krepinevich has identified ten previous RMA's over the past 700 years; this chronology is considered a concise version of RMA's. Some of the past RMA's are the artillery revolution which took place on sea and land in the fifteenth century, the fortress revolution of the sixteenth century, the gunpowder revolution of the sixteenth and seventeenth centuries, the Napoleonic revolution, the machine gun, the naval revolutions of the nineteenth and twentieth century's, the revolutions in aviation and information and the nuclear revolution. As said before, the view on what consist of a military revolution varies with different viewpoints. Crossbow and the six-foot yew longbow can also be treated as RMA's along with the German blitzkrieg. As there is no consensus on what an RMA actually is – though analysts agree on certain characters, there is no common definition adopted for an RMA – even guerrilla war fighting all over the world could be considered as an RMA (Murray 1997). The future of contemporary RMA is predicted to be of smaller and faster units with most military operations being joint operations.

The RMA schools

The notion of RMA was initially known as Military Technical Revolution (MTR). This concept of MTR was introduced in the Soviet Union in the 1980's. The opinion of expert's is that the technological inefficiency of the Soviets made them

delay the expansion of the concept. The concept of MTR then seeped to the United States office of net assessment and it was reborn as the Revolution in Military Affairs (RMA). Today, the RMA is a widely used term in military sphere. The definitions of RMA are various as there are various interpretations of this term and also because RMA is a concept which is still evolving.

Among the four major schools of thoughts on RMA, the first school of thought is considered the most realistic and popular among the four schools. The System of Systems school of thought believes that the computers and communication systems can be improved and that they have the potential to improve the military effectiveness in combat. The second school of thought is the Dominant Battlespace Knowledge (DBK) school of thought, which assumes the advancement of sensors to transfer full battlespace data. Dominant battlespace knowledge will allow the leadership to operate in different theatres simultaneously. Processing of mass data and the use of sensors will allow the players to acquire dominant battle space knowledge to an extent. The third is the Global Power, Global Reach school of thought that believes in the advancement of air forces and deployment of lethal weapons. The last school identified is the Vulnerability school of thought, which throws caution to all these ambitions and speaks of asymmetric response from adversaries (O'Hanlon 2000). All these schools of thoughts give us an elaborate idea of how the revolution in military affairs in the future could shape up. In the future, contemporary RMA is considered the key turning point in the evolution of military hardware, tactics and organisation.

The manifestations of contemporary RMA capabilities

The campaign in Iraq by the coalition forces in the year 2003 is the recent demonstration of the RMA capacity of the western coalition forces. The campaign has been regarded as a deviation from the usual because of its manoeuvrist character. The campaign targeted the responding capacity of the Iraqi army and left them disoriented. Thus the Iraqi forces could not hold on to the American fire power. The American air power had a significant role in disrupting the Iraqi military commands. With the post Vietnam developments, the American air power had improved both in quality and quantity. In the Iraqi campaign, the Americans used Joint Direct Attack Munitions (JDAM) which had Global Positioning System (GPS) which in turn could make the

conventional bombs act as satellite guided weapons so that they would hit their target accurately. This was an excellent show of the improvement of the conventional weapons with technology. The use of air power was efficient in the Iraqi operation. The aerial operations were guided operations so that they do not miss the target. The percentage of use of dumb munitions was very little. Accurate artillery fire, helicopter gunships and unmanned aerial vehicles added strength to the American assault on the Iraqi forces. After the Iraqi campaign, more emphasis has been given to the air power. The American Abrams tanks proved to be destructive for the Iraqi T-55's and T-72's (Biddle 1998). The Iraqi rocket propelled grenades could not bring back any victory and the Iraqi forces were not spared attack at night as the American night vision googles prevented the regrouping of the Iraqi army. The Iraqi forces were devastated not only because of the advanced western army but also of their own plight as their weapons build up had suffered because of the sanctions on their military build up.

As discussed in the preceding section, the Iraq war is considered by some analysts as the successful demonstration of the RMA capabilities of the western states in particular, the United States of America. This is because, although the RMA capability has been demonstrated in Vietnam and Kosovo by the United States, both these campaigns did not concur with the degree of success that the Iraq campaign achieved. The success of the Iraq operation has made the United States of America increasingly devote itself to a military transformation, especially in the interest of new weaponry in the air-land operation. Though the American prowess is unmatched in military affairs, it has encouraged other states to procure effective munitions. These activities can be noticed in the development of drones by the British military and Japanese interests in anti missile defences and satellite surveillance. The developments on the Japanese front could also be the response to the North Korean procurement of rockets.

Revolution in military affairs in the west

In the language of the western RMA proponents, the revolution in military affairs is also known as military transformation. The present military thinking focuses on power projection, mobility and professional training. With the introduction of the RMA in the United States, the rise of the cost of personnel has been cut down from eighteen divisions in 1990 to ten divisions in 2003. Thus more and more states like

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France, Russia and Italy began to adhere to conscription as a part of military modernisation. RMA, in the present world offers survival tactics for warfare designed as precision strikers, full dimensional protection, precisely focused logistics, dominant manoeuvre in battle field and warfare using information technologies. These are also the aims portrayed by the contemporary RMA proponents for the western states along with the ordering of the organisational structure accordingly. To achieve these aims, the interoperability of the military structures is necessary. In the West, a step in this direction had been taken as early as the 1990's with the creation of an expeditionary warfare division in the office of the Chief of Naval Officer and the Goldwater-Nicholas Department of Defence Reorganisation act of 1986[2]. This in turn enabled the strengthening of the position of the Chairman of the Joint Chiefs of Staff and established a joint acquisition system. The structural changes or the combining of the military structures can be noticed in Britain and France. In Britain, the joint institutions are the Joint Rapid Deployment Force, Joint Head Quarters and the Joint Services Command and Staff College. In France, the powerful institution which advocates the new RMA doctrines is the Joint War College Training. The western states, the United States in particular are keenly interested in reaping the full benefits of the contemporary RMA (O'Hanlon 2000).

The high performance of the United States in 1991 using technology infused weapons and their rapid innovations in computers and sensors has helped the United States keep their place as the world's superior military power. This becomes the reason as to why the RMA direction is headed from the direction of the United States of America. Swift, unequivocal victory in campaigns with very little or no casualties is the vision of the contemporary RMA which is being pursued by the western states. The pursuance of RMA by the United States has been confirmed for a long while. The practices in the United States military has accounted for this change. The United States force structure has declined but at the same time, there has been no decrease in responsibilities and missions. They believe that limited tolerance to casualties can be achieved through the contemporary revolution in military affairs. New conscription measures, aversion to casualties and with other measures, the RMA proponents in the

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[2] Before the enaction of this act, the military of the United States had different commandants for each service (army, navy etc.). This reflected in the absence of coordination and interforce rivalry. This act was introduced to overcome these as difficulties. Under this act, the command was centralised and simplified. This is considered an initial step in the US RMA. This coordination of services was successfully tested in the 1991 Gulf War.

United States believe that, pursuing the RMA will enable the United States to wage high intensity wars and total or decisive victory.

The purpose of the pursuance of the concept of RMA in the United States can be found in the reports published by the Pentagon. The Pentagon, in its Quadrennial Defense Review (in 1997) has given ample space for the happening revolution in military affairs. The reports of the independent NDP (National Defense Panel) has also given due recognition to the concept of RMA. This transformation is said to be a follow up of the earlier joint vision 2010 document[3]. Though the Pentagon reports are ambitious in nature, it has advocated a slow progress towards the realisation of the goals. This tardy action plan has been criticised by the NDP. Analysts who have indulged deeply in the study of the United Stated pursuance of RMA are of the view that the Pentagon could be projecting a low profile purposefully (O'Hanlon 2000).

The western armies have always remained as strong armies in the past and this can be attributed to their effective use of technology for military purposes. However, they had slow command systems and capital-intensive military equipments. Their weapons performance did vary with battle arena, as harsh conditions were not well adapted by them. The current RMA has taken care of these vulnerabilities of the western army (Alford 1981). A factor, which is shaping current RMA, is the broad understanding of the expected battle environment. This could be one reason for the developments in aviation becoming more demanding and significant than the rest of the developments within the military. Another factor is the understanding of the expected enemy, their weapons systems, tactics and organisational structures. The western military is gearing up for conventional wars with the infusion of the current RMA capabilities. Armies are understood to evolve during peace time and this is precisely what is occurring in the West, the United States in particular. The strong emphasis on the RMA flows from the values that the western societies hold on war. The western societies are of the view that war should be civilised, modernised and should be waged with the use of advanced weapons systems. Their willingness to accept conscription and aversion to casualties to civilians give ample space for the development of the contemporary RMA in the west.

There is another mode of warfare, which is developing alongside the contemporary revolution in military affairs. This mode of warfare, known as the cyber

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[3] Joint vision 2010 is the blue print of the US military force for future military operations. This provides common direction and goals which are to be achieved by the year 2010.

war, is used by the states to paralyse the information gathering and disseminating systems. The theatre for this warfare is cyber space. Here, it is important to distinguish between cyber war and net war – both the cyber war and net war is based on information oriented approach to battle but cyber war is normally about high intensity conflicts while net war is about low intensity conflict. Cyber war involves or features military forces against each other while net war features non-state, paramilitary and irregular forces. Both these types of war can be operated at the same time. The United States of America, which has an array of advanced technologies and flexible organisational structure can make cyber war an effective way of paralysing the enemy forces. This approach of utilising the cyber war will have to be in the defensive mode, as the adversaries will always have the option of net war and asymmetric warfare, which could turn to be very complicated (Arquilla and David Ronfeldt 1997). Cyber war and net war has sometimes been classified under the rubric of revolution in military affairs. Some analysts classify cyber war and net war in to the information revolution. Cyber war has been used as a mode of combat in the campaign between the United States led coalition and Iraq and as early as 1970's in the North Vietnam, between North Vietnam and Viet cong.

The RMA in the United States, its future and its limitations

An understanding of the military capabilities of the western states and in particular of the United States would give a good picture of how and why the western states are ahead of the others in military affairs. For this, an idea about their weapons, technology and their interplay in the battlefield would be necessary. The RMA capabilities of the West can be understood from the literature available on the recent campaigns initiated by them. There are also works on the new technological systems introduced in the military, which have been of help.

The United States is an order above the rest of the states in the world in the matter of defence in particular. Analysts reason this as more defence spending and resource utilisation. The United States defence spending is almost five times more than the NATO states. Not only that the United States spends more and produces more but it also commands more capability than the rest of the western states. Even the NATO forces are reported to command only almost fifty per cent of military capability compared to the United States. Some of the capabilities that make the

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United States stand apart as a remarkable military force are long range strategic transport, mobile logistics, stealth technology, advanced precision guided weaponry, global surveillance and communication systems. These systems are reportedly unmatched by any other state in this century (Freedman 1998).

.   Technology is recognised as a significant player in combat, in the sense that, technology can undertake both the roles of offensive and defensive technology. The quick mobility, increasing effectiveness of weapons and explosives and difficulty to detect makes the RMA an offensive strategy. Offensive warfare allows the enemy to conceal its weakness by strikes asymmetrically in offensive manner but the current RMA is seen more as a support for defensive warfare methods. The current RMA is said to reinvigorate the defensive warfare methods, as the current RMA is more about tracking devices, which would help to bring down the reaction time to retaliate (Morgan 2000). The twentieth century industrialised states has benefited largely with the use of technology in the use and organisation of their military forces as well as in other areas. Changes of magnitude have been achieved by exploiting the rapidly improving capabilities realised through technological adaptation. In the post Second World War, a striking development has occurred in the development of weapons with emphasis on deterrence mechanism. At the same time, a very dramatic development has occurred in the realm of conventional weapons also. The rapid and radical technological adaptation in the military forces has led the western states military turn themselves into technologically run militaries unlike the rest of the states. Among the states of the world, the western states have always had a comparative advantage in technology and as they had capital, good industrial base and scientific expertise to back them, it was not that difficult to incorporate technology into their desired spheres. Most of their deficiencies were compensated by the exploitation of technology. The United States employed weapons technology to create an edge in the military field and has ever since been holding on to it. The important developments in this area since the 1970's are as follows: precision guidance; remote guidance and control; improvement in munitions; target identification and acquisition; command; control and communications; and electronic warfare.

Communication systems are critical to American military technology. The United States keeps alternative and old communication systems in case, enemy attacks jam the global positioning systems. Along with this joint service, communication systems are being improved. The Department of Defense in the

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United States have planned to purchase better reconnaissance capabilities like enhanced spy satellites and new fleets of Unmanned Aerial Vehicles (UAV's). The planned purchase of the Joint Surveillance and Target Attack Radar System (JSTARS) has also been increased (O'Hanlon 2000). All these are predictions of a future RMA for the United States but there are more avenues that it should be concerned. On one hand, the conventional military capacity of the United States is being strengthened by the infusion of high technology but the responses of the less advanced states could be by using chemical and biological weapons. Better capabilities should be developed to counter such drastic steps like better protection equipment, stocks of antibiotics, other vaccines and improved squads. The concept of RMA will witness further improvements under the United States research in military excellence. Surely, the United States today is striding ahead in the RMA capability but at the same time, the vulnerabilities of the RMA should also be taken into account.

In areas where target acquisition and tracking poses problems, sensor technologies have been harnessed and incorporated in air-to-surface systems. The guidance techniques can be identified into seeker guidance, correlation guidance and precision positioning. The PGM's[4] using the seeker guidance is made to home on static or moving targets which are identified by laser beams. The precise positioning interprets signal waves from synchronised transmitters to verify the errors of inertial guidance system on military vehicles. Correlation guidance is used in long range targets which cannot be easily designated. Remotely Piloted Vehicles (RPV), though they have been in use for some time were also given a face lift along with the PGM's. The increased capabilities in RPV's and PGM have also resulted in the refinement of conventional munitions leading to increased destructive capacity of the military forces.

A major effort has been initiated in the United States to upgrade the Worldwide Military Command and Control System (WWMCCS). The WWMCCS includes the modernisation of computers, advancement in airborne command and further improvements in communication systems and their inter-operatability with all services of the military. The electromagnetic spectrum has also found its use in

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[4] The Precision Guided Munitions (PGMs) are a very accurate and refined guidance technique. The promise of the PGM's or the precision guidance munitions are 'one shot, one kill'. They are basically a growing class of bombs, missiles and artillery projectiles with a good per cent of probability in hitting the target than the unguided munitions.

military purposes in the form of electronic intelligence and electronic counter measures (Alford 1981).

After the invention of radars in the early twentieth century, radars have come a long way. The United States radars – the US Pave Paws, Cobra Dane and PARCS can locate and track objects, which are more than thousand kilometres away. They have the capacity to tune off selective detection beams coming in their direction thus jamming their detection. Lacrosse imaging satellites are an example of all weather reconnaissance capability, which has good resolutions. Phased-array radar technology is a significant component in radio eavesdropping. The Joint Surveillance and Target Attack Radar System aircraft (JSTARS), which is one of the latest introductions of the US military can scan the ground and simultaneously be kept in search mode for targets. JSTARS was first used in operation desert storm. The vulnerability found in JSTARS is in its inability to distinguish between civilian and military vehicles (Freedman 1998).

The new laser technology can make it possible to measure the speed of the wind which in turn can be calculated when precision munitions are released from their trajectories. Some analysts are of the opinion that with laser technologies, the accuracy of the precision munitions can be improved. Radar satellite constellations that can orbit the earth and report with good resolutions and radars with more penetration capability are being designed. The ongoing miniaturisation has implications of designing precision guided munitions with small radars in them. Acoustic and motion sensors were deployed in the Vietnam campaign which could detect helicopter flights, gunfire and human traffic. The acoustic sensors after the Vietnam campaign have advanced in capability with the GPS. The acoustic sensors are gaining significance as the Brilliant Anti Tank weapons (BAT) will be making use of them in future campaigns to detect sound waves. Miniaturised sonar sensors will increasingly be used in submarines and under water vehicles in future. Though the radars and sensors are being developed rapidly their countermeasures would also be developed by other states. The vulnerability in their performance has been identified in the Kosovo war in which they underperformed due to bad weather.

The information system has been called the critical element in contemporary warfare. Information systems have been specific in nature and it is only recently that they are being integrated in to the military domain. The future information will be digitised and will be transmitted using digital radios. Experiments on Joint Tactical

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Information System (JTIDS) are being conducted by transmitting information from satellites via aircraft receiver to fighter strikers. This information transfer from satellites to weapons platform would make the battlefield digitised.

With the developments in computers, the stream of raw data, which enters a computer via radars and sensors, will be processed and the result would be transmitted to the radio within several minutes. The exchange of data within the navy ships has also acquired new dimensions in speed. The military has developed data compression techniques using which information can be transmitted to the electromagnetic spectrum. The Global Positioning System (GPS) is reported to become more accurate in future wars. The GPS is a major breakthrough in military operations. The United States military has planned to increase its military GPS signals with its satellites. The major threats to communication systems are jamming GPS signals and other data. Though anti-jamming technologies are available, only a technologically strong state can protect its data.

In the contemporary RMA, rapid improvements could be developing in sensors and electronics but at the same time, the mechanical and structural platforms, which uphold these technologies, are also undergoing change. One of the characters, which have been attributed to the contemporary RMA, is the infusion of conventional weapons with stealth technologies. There have been changes in the propulsion power, design of the equipment and dynamics of vehicles over a period. In the case of aircraft, the same aircraft has undergone improvements roughly over two decades. For example, the aircraft F-22 has improved in engine technology and is more efficient than its old version known as F-15 (O'Hanlon 2000). Changes occurred are in terms of degree rather than of kind. The Pentagon has designs of manufacturing transport aircraft which would consume less fuel, weigh less and which would move faster. The number of UAV's in the US military is increasing day by day. This could be because of the low risk associated with the UAV's. That not only the UAV does not need a pilot, it can drop bombs at pre decided targets and it can be used to attack and jam enemy forces. The war in Kosovo saw improved weapons of the western military since the 1991 Iraq campaign. The western coalition's large collection of UAV's and JDAM bombs dropped from B-2 bomber with accurate radars have been counted as definite improvements on the munitions.

The traditional equipments have not undergone drastic changes. Though changes have taken place, they have been gradual changes and not radical changes.

The growth of rocket technology has been considered slow; the areas where rocket technology has improved are fuel efficiency and basic rocket design. There are plans to combine the benefits of rockets and jets to acquire more efficient propulsion system (Libicki 1995). The surface combatant vessels and basic carriers have undergone modest changes in terms of basic propulsion systems, shapes and structures. Progressive ideas are being initiated on this front while some new capabilities have been developed and integrated like the landing-craft air cushion (LCAC).

Tanks have always been criticised as too heavy but lighter tanks could take some more time. The M1 Abrams tank, which performed well in the *Operation Desert Storm* is remarkably lethal and survivable. In the case of tanks, the focus is on night vision, communication, computing capabilities, protection against Weapons of Mass Destruction (WMD) and designated munitions. Though the capability of tanks are being improved, the ongoing trends in technology expansion favours munitions combined with airpower as they have the possibility of striking and destroying the tanks (Biddle 1998). Unmanned tanks are being used for mine detection. There could be further expansion in this area also.

Cruise missiles and Joint Direct Attack Munitions (JDAMs) which rely on radio signals and radars are considered effective though not as effective as laser-guided munitions. The United States possesses anti radar systems known as High-speed Anti-Radiation Missile (HARM) which was used in the *Operation Desert Storm* with success. Initiatives have been taken by the United States to improve on the HARM. Since the Gulf War, the United States have been making progress in its Theatre Missile Defense (TMD). The US Patriot PAC-2 is an improvement on the Patriot. A new PAC-3 is also on the way.

The role of infantry has not been ruled out in future wars. In asymmetric warfare scenes, the ground forces have been predicted to be more helpful than advanced munitions in combating the enemy forces. Ground forces are predicted to be helpful in overthrowing extremist regimes causing genocides and international crisis like situations. The combined operation of the airpower and infantry is on focus as essential for future warfare by western states. The challenges faced by the airpower like locating and targeting enemy forces, which are hidden will be the domain of the ground forces. Radars and sensors are not invulnerable; sensors and radars have short ranges and are reported to perform weakly in case of thick clouds, tree trunks, metals and some kinds of soils (O'Hanlon 2000).

Improvements are on the way in the method of infantry operations with the development of robotics. Robotics is presumed to protect the soldiers while investigating near by areas with volatile nature. The improvements in robotics are not only a boon to the ground forces but also in other areas. It is predicted that vertical-lift UAV's, matchbox toy-sized wheeled vehicles and other tiny aerial vehicles could be developed which could carry sensors around the battlefield. Miniature video cameras are available which could be deployed to have better battlefield knowledge, which could minimise the casualties of the ground forces. Moreover, night-vision detectors which enhance the city lights and the moonlight could give enough visibility for soldiers to work even in dark conditions. The ground forces can also make use of lidars (Light Detection and Ranging) to search for targets (O'Hanlon 2000). A lidar system is being developed to trace aerosol particles in air which can be active as far as forty kilometres.

The United States aviation power deployed in the *Operation Desert Storm* destroyed nearly 3,000 pieces of heavy armoured military equipments with precision munitions by flying at high altitudes to avoid attacks from Iraqi ground forces (Freedman 1998). The kill probability estimated is roughly 20 to 30 per cent which is considered exceptional in the military terms. The equipments used by the armoured forces were thermal imaging equipment, laser range finders, stabilised gun barrels and depleted uranium shells, all of which accounts for a kill probability of 85 per cent. The success manifested through this campaign has convinced the American RMA proponents to consider the enaction of radical measures to realise the revolution in military affairs before other states do the same.

Air strikes played a crucial role in *Operation Desert Storm* and they are predicted to be very effective in the future along with the infantry. The stealth ground attack aircraft like the B-2, with improvements could play a decisive role in combat (O'Hanlon 2000). The B-2 aircraft has low energy aircraft which makes it difficult to be detected by the enemy radars. They are not detectable at night time but daylight could make them detectable thus proving that even they are vulnerable. In 1999, radar jammers in the NATO war against Serbia accompanied the B-2 aircrafts. The developments in radar technology in the future are expected to give a lift to these aircrafts. The RMA debate seems endless with the emergence of new options and technologies. More and more analysts are accepting RMA as a combination of more than one factor and not just as new weapons in the military force. A thorough review

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of the works of RMA will give us the understanding of the deep study done in the past few years on this relatively new area in military science. The proponents of RMA are keen to pursue and exploit the potential character of the RMA but they lack a procedural roadmap for this. The implications for a future RMA and the possibility of RMA as future defence policies of states with superior military organisation are yet to be probed in detail. The development of the contemporary RMA could have the potential to define the organisational principle of the defence structures of advanced states; it could be of assistance in developing and improving bureaucratic relations and could help states to gear up to face the new challenges developing in the security front. The general applicability of the RMA concept is under study.

The United States defence policy is, largely identified with the RMA. The increasing need for overseas basis in the future and the type of multinational military operations perceived by the United States defence analysts makes the RMA a significant component of their defence policy. There are many in the defence circles that believe the contemporary RMA to be an American phenomenon. The RMA proponent of the United States argues that with the development of the current RMA, the US troops deployed in far off lands can be called back. This proposition is very doubtful in practical terms for the simple reason that the US will not be able to wage a war or conduct military operations from its own territory.

The collapse of the Soviet Union has not given the United States a new competitor. The rise of a peer competitor could pose a threat to the United States. Though the United States has superior contemporary RMA to their credit, there are limitations also for this new concept. Of the major controlling factors, the evolution of competition could pose as the most dangerous. Budgetary constraints and the economic linkages to the military are the other controlling factors. In the future, it is argued that no major wars could break out but instead small wars or regional wars could break out (Tilford 1995). These small wars are predicted to be wars with RMA components.

NATO's defence capabilities initiative, established in 1998 had identified the shortcomings in the western deployment of RMA. These shortcomings were made the base for planning the long term and short-term projects in military affairs (Freedman 1998). The European states, in spite of having RMA capabilities, are dependent on the United States. Without the United States of America, the western coalition would

seem to be crippled. This is because, the long range and short range capabilities of the United States has not been acquired by any other state so far.

The budget allocations of the United States is five times more than the other western states and the outcome of the budget allocation is also effective than the other western states with partial exception given only to the Great Britain. The United States is considered not only as the sole surviving superpower but also as the most remarkable military power of the twenty first century. There is no western state in the twenty-first century, which is considered as powerful as the United States now. Naturally, the western coalition forces attribute a leadership status to the United States. As stated earlier, among the western forces, most of them have been found incomparable in military strength with the United States. This dependence of the other western states could pose a danger to the future ambitions of the United States. The differences in the technological advances of the states in the western alliance system could foster a two-tiered system. The absence of common military equipments can also trigger differences at a later stage. Such a system could bring in lack of coordination in military campaigns, which could weaken the system.

The less powerful adversaries of the western coalition could be weak but they would not take much time to catch up with technological advances in the western military. They would learn to challenge the western forces by acquiring advanced precision guiding missiles, advanced mines, anti satellite weapons, satellites, computer viruses, biological weapons and other weapons of mass destructions. The vulnerability school of thought of the RMA has made it clear that the adversaries would strike back with asymmetric warfare tactics. Adversaries using asymmetric warfare tactics could exploit the United States' dependence on large bases and other vulnerable assets. This could become a big blow to the American aversion to casualties in combat.

The greatest disadvantage of the United States military technology is also the greatest advantage of their adversaries as however advanced the United States proclaims to be, they cannot track and attack targets, which are hidden. Their adversaries in the form of guerrilla attacks, terrorist attacks and suicide bomb attacks can exploit this disadvantage.

Though the western states are ahead of other states in terms of RMA capabilities, the Kosovo campaign left the states included in the campaign in doubtful circumstances about their capability. The Gulf War in 1991 told the story of a

different nature of combat. Though success was achieved by the United States, the shortcomings of the RMA can also be seen in this war. One example is that of the ineffectiveness of the infrared, electro-optical and laser systems as these systems could not perform as predicted due to weather, dust and smoke. It has been reported that some radars even had difficulties in distinguishing trucks and tanks. It is in this regard that the United States air force predicted superior detectable munitions by the year 2025.

The pursuance of RMA is becoming expensive in budgetary terms and in terms of political ambitions and global engagements. Though the roadmap of the RMA cannot be predicted with the survey of the RMA capabilities as of now, there is a positive atmosphere for this concept within the leadership though there are different views adopted in other circles. The western states with the dominance of the United States cannot be considered to be RMA superiors of this century as the RMA capabilities are on a growth path even in these states. Advances in the military of the United States and the West could go on as there are more areas in the military, which can have improved weapons. The combination of various munitions and submunitions with other weapons platforms could bring in more advancement to the military force projection.

In the present century, bilateral and multilateral ties are being forged with vigour between the world's states making us increasingly aware of the rise of the non-western powers from their deep slumber. The negotiations and MoU's being initiated is a forecast for a progressive future of the RMA. Joint exercises of the forces of the superior military powers at strategic places are becoming common occurrences. The rising powers like China and India are seen as transforming their economic progress into military might. There are other states also that are pursuing RMA and most of these states prefer the duplication of the western RMA, which can suit their choices and preferences. The mid twenty-first century could very well be witness to more new method of warfare, which was just considered fiction in the twentieth century. As mentioned in the introduction of this chapter, the study on RMA seems inconclusive as the RMA is still evolving.

Chapter III

THE EMERGENCE OF RMA IN NON-WESTERN STATES: COMPARING CHINA AND INDIA

Emergence of RMA in non-western states

The growth of RMA in the non-western states has been triggered by the performance of the United States in the Gulf War. This is because the non-western states do not have any other western campaign to choose which has deployed the RMA capabilities of the West in this open manner. Among the Asian states, China and India are considered as growing military powers. This growth of these states as military powers can be attributed in a major way to the parallel growth of their economies. It is evident that along with the western states developing RMA capabilities, the non-western states are also developing RMA capabilities but the non-western RMA capabilities are customised versions of the western RMA. The non-western states are faced with a number of obstacles in initiating an RMA. The major threat perception of the western states was from the Soviet Union but with the collapse of the Soviet Union this threat dimension decreased in magnitude. In the twenty-first century, this threat dimension has changed for the United States. The rising economic powers and the so called 'axis of evil' have been in focus as the new threat for the United States.

The revolution in military affairs in the western states is far ahead of the revolution in non-western states. The major factor which has contributed to this could be that the contemporary RMA was initiated by the western states. The security threat emanating from the western dominance in military affairs combined with the interventionist policies of the advanced states is also considered as a cause for the emergence of RMA in non-western military. RMA in the non-western states is slow in progress and most of it is hybrid or of indigenous variety. States other than the affluent states which are incapable of pursuing RMA capabilities have diverted their

attention to seek easier options other than the RMA like asymmetric warfare capabilities.

The political decisions and the economic situation of a state have an important role in shaping of RMA. In the case of China and India, more than the political decision, there are other factors which have a major role in the development of the contemporary RMA. The technological input and the strategic concerns of these states have, in a big way, influenced the growth of RMA capabilities of these states. The geological positioning of China and India has an important role in these states pursuing RMA. The technological capabilities of China and India are also a factor that is involved in ushering RMA to China and India. Other motivations for pursuing RMA capabilities could be the advancement of peer competitors in defence technology and the technological gap generated by this. The security challenges which are faced by China and India are diverse in nature. The instability on the periphery and beyond the periphery of China and India is a major security threat which had caused the adoption of RMA. The strategic decisions made by China and India has to do with the oceans near these states, threat scenario's emanating from East Asia, turbulent neighbours and western intervention. The protection of the territorial integrity and sovereignty is the main task of the defence forces in China and India. The defence policy of these states are designed in such a way as to achieve the national goals which can be achieved only with a peaceful internal and external environment, in which such development can be pursued. The changing phase in the international relations between states could bring in a new multi-polar world among which China and India would have an important role to play. A National Intelligence Council (NIC) Report of the US (in 1999) had observed that among the states considered, India, China, Russia and Australia have the greatest potential to achieve RMA (Hashim: 1998) . The main non-western states besides India and China which are pursuing RMA capabilities are China, Japan, Russia, Israel, Singapore and South Africa.

The imitation of a western based RMA capabilities may not prove effective in the non-western region. This can be reasoned out as the differences in terrain, political and military ambitions and threat perceptions. The Russian army is a mere remnant of the disintegrated force of the Soviet army. In fact, Russia tried to preserve all that was left of the Soviet army but had to give it up at a later stage for modernisation. Though the MTR was conceptualised in the Russia military circles,

the modernisation of Russian forces has been sluggish in practice. The incorporation of technology along with necessary shift in the structure of doctrine and organisation are of significance in pursuing the contemporary RMA. This is where the Soviet army failed. It was not until the 1990's that Russia was able to rebuild its past glory. The disagreements on military policies between the leadership and the military officers and lack of funds available for reforms have been pointed out as the cause which has hampered the progress of the Russian military modernisation until the 1990's (Goldstein 2001).

In some non-western states like South Africa, RMA has not been incorporated into their defence planning but traces of RMA thought has been reflected in their thoughts and practices. The American inspired RMA has definitely made imprints in states that aspire to be technologically advanced state. Observers are of the opinion that South Africa had begun RMA pursuit since 1994. Though the RMA capabilities may not be effective in a strife torn South Africa, references to the RMA can be noticed in policy documents (Pretorius 2006). The defence document of South Africa points to the development of a region oriented force with advance technology infused into a conventionally armed force.

RMA in China

China has been gathering attention for some time by analysts as China is considered to be growing into a peer and competitor to the United States. The People's Liberation Army (PLA) has been involved in the politics of China and is considered very powerful in China. The influence of PLA can be seen in the foreign policies of China, its arms sales, security issues and technology transfers. The PLA has undergone a change in their doctrine since the 1979 war with Vietnam. The wars with Vietnam made China re-evaluate the strengths and weaknesses of the PLA (Saighal 1999). The doctrinal change within the PLA began to be aimed at limited and local war as a major war was not foreseen in the near future. This change in the Chinese doctrine has been attributed to the break up of the Soviet Union as with the break up of the Soviet Union, an immediate major war was ruled out. The change in the PLA's doctrines became noticeable in the early 1980's when the 'people's war under modern conditions' was articulated. This war concept made use of modern weapons and technology though it still had Mao's doctrines embedded in it. The

Chinese calculations on the local wars was based on the then world order[5]. There was again a change in the PLA's doctrine after the Gulf War. After the Gulf War, the doctrine of 'limited war under high technology conditions' was adopted. The Central Military Commission of China has forwarded the concept of local wars, medium level conflicts and major wars for China and the PLA has been exhorted to prepare for such wars (Singh 1998). For these, the PLA identified the following military capabilities: the development of automated command, control, communications and intelligence; precision guided munitions; technologically educated army personnel and reserves.

Shifts in strategy and tactics have also been noticed by analysts with the PLA coming forward with 'active defence'. After the Gulf War, active defence has been adopted as the tactical operative defence of the PLA with the overall doctrine of limited war. The Chinese have always adopted defensive and reactive methods and active defence advocates offensive action. It is essentially deterrence by forward positioning. This includes pre-emptive strikes and subordination of the inferior through superior methods of warfare. The Gulf War has made the PLA incorporate more technology into weapons manufacture (Shambaugh 2002). President Jiang Zemin is quoted as

> "the Gulf War makes us further see the functions of science and technology in contemporary war...the functions of science and technology cannot be ignored"

This has led to the adoption of another doctrine which has included electronic warfare methods in the PLA (Blasko: 2001). The PLA has now emphasised on acquiring new capabilities like improved guidance, precision guided munitions, C^3 I, anti-ballistic missile defence, night vision, electronic warfare methods and its counter measures.

The Chinese strategy has also changed along with changes in the doctrine. The strategy of China was focused on the Soviet Union but now it has been shifted to the frontier or 'strategic frontier'. According to the Chinese analysis, the land frontier could confront competition while the other two conflict zones which have been identified are the ocean and space. The changes in these two areas (doctrine and strategy) have led to changes within the organisational setup also. The American air-

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[5] There were efforts between the two superpowers to avoid direct confrontation and later on the disintegration of the Soviet Union.

land battle in the Gulf War has created paradigms in the contemporary RMA. The Chinese has reorganised the PLA forces on these lines. The need for interservice coordination has been accepted as a necessary change in the PLA. Merging of commands under a single head and bringing them under direct control have been initiated. The first tri-service exercise was conducted in the year 1993 (Singh 1998).

To play a critical role in combat, Rapid Reaction Units have been trained. These units have been introduced in the PLA to strike and paralyse the enemy and to seize the enemy locations. These Rapid Reaction Units are standing forces which are capable of quick and lethal response (Singh 1998). According to Chinese military analysts, the states which are capable of conducting high technology warfare and which are in the Chinese periphery are Russia and India. So the RMA of China will have special reference to these states. China's PLA has emphasised the importance of integrating speed, mobility of forces, lethality of weapons and C^3 I technologies into air, land and naval forces. The Chinese forces are aware of the fact that performance depends on the training which has been available. The air force divisions are occasionally given training within the state and new aircrafts have been purchased from other states to improve the quality of the performances. Emphasis is especially on the combined operations of the forces rather than individual performance of the forces. All these have changed the Chinese forces into a professional force.

The principles regarding the tactics of the Chinese armed forces have also undergone changes since the 1980's. The traditional defensive People's Army always stood by the tactic of alluring the enemy forces into a People's War but now the tactic has changed to gaining initiative by striking first. For this move, information about the enemy forces is considered necessary. The age of the mass army has now been replaced with elite troops. Winning over the inferior force through the concentration of weapons and forces, in order to overwhelm the opponent is another tactic which has evolved. The last tactical principle adopted by the Chinese forces is to wage a quick battle and not to prolong the battle so as to achieve victory through quick solution. Apart from the tactical principles, battlefield tactics have also been developed as a part of Chinese force modernisation. The distinction between offensive operations and defensive operations of the PLA has become less obvious. This is because the new weapons have the capability for both offensive and defensive operations. The concept of 'in-depth strike' adapted in to the PLA during the 1980's

has had a makeover. Though in-depth strike is still a battle field tactic, the way of conducting it has been changed.

The modernisation wave taking place within China has its effects on the Air force and the Navy. The PLA Air Force is considered weak among the PLA forces. The air force fighter force includes the J-5, J-6/Q-5 and J-7. The bomber forces have slow performance and there are no in-flight refuelling tankers which are of great importance in war times and no Airborne early Warning and Command and Control Systems (AWACS). New procurement policies are being undertaken which is considered to have the potential for developing Chinese aircrafts. The only element of disappointment here is that though absorption of foreign technologies can be initiated in this manner, the time element in doing so could delay the developments. *Jian-10* is a fighter aircraft which is a hybrid of the US F16A/B, Chinese and Israeli elements present in them. It is being developed by China. *Jian-10* is based on the prototype F-16 from Pakistan and is being developed with the help of Israeli scientists (Shambaugh 2002).

The Chinese Navy is a pride to China as it is the third largest navy in the world. Large scale modernisation efforts are taking place within the Chinese navy. Improvements have been occurring in the submarine development section. China has purchased advanced submarines from Russia which can carry more warheads. In the arena of delivery systems, modernisation has been adopted to acquire improved accuracy and survivability. China has land based missiles, submarine launched ballistic missiles and bomber forces though their number is less. A three stage solid propellant Intercontinental Ballistic Missile (ICBM), DF-41 is expected to join the Chinese delivery system. Land mobile solid propellant Intermediate range Ballistic Missiles (IRBM's) and multiple independently targeted re-entry vehicles are also supposed to join the force structure soon as they are in the plan list of the Chinese forces. The Chinese efforts in missile development are focused on tactical missiles with short ranges as they consider immediate threat could only arise from their periphery.

In China, the information technologies and other new technologies have ushered in the age of satellites, space shuttles, manned space ship and space stations. The new weapons like laser weapons, stealth weapons, mirror beam weapons and many more are considered to make space the next operational zone (Goldstein 2005).

Space is being increasingly considered as the next platform for operations as can be seen from the US armed forces discussions on a new force, namely the space force.

RMA in India

The modernisation of Indian defence forces had begun in the mid 1980's. This was not on a big scale though there was a focus on increased mechanisation and advancement in airborne and missile capabilities. The Indian defence forces are a mixture of industrial age forces and the present technologically advanced forces (Saighal 1997). The Indian army has more of the industrial age force structure even now while the navy and air force are technologically more advanced with less dependence on manpower. The Indian growth in the RMA direction is said to be a gradual growth process. The Indian RMA strategy is based on developing capabilities which can overcome those of their potential adversaries.

At the end of the Second World War, India had realised that the next war will have to be waged with combined force structure of at least two services if not three. It was with this in mind that the National Defence Academy and the Defence Services Staff College was set up where all the cadets of the three services were trained together. Even with all these basic foundations done, the Indian forces remained as the least integrated for a while (Singh 1998). Though these initial steps did help the forces in developing inter personnel relationships, the transformation of this into the understanding of the operational requirements had been slow. The modernisation in the 1980's was not pursued on a big scale as the budget available for defence purpose did not rise to the expected level needed for force modernisation. By the year 1991, defense budgets increased though there was still no scope for a new initiative in modernisation. The ongoing phase in the Indian defence modernisation began in the 1990's. The Kargil[6] War brought about an abrupt stop to this ongoing phase though the modernisation programme was restarted again. The economic policies of the 1991which revolutionised the Indian economy helped the restarting of the modernisation programme. It can aptly be said that a revolution in economic affairs has preceded the Revolution in Military Affairs. By the year 2001, more reforms were introduced within the defence forces. Some reforms which were suggested during that

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[6] Kargil war or Kargil conflict was the armed conflict between India and Pakistan in 1999 which was the cause of the infiltration of the Pakistani soldiers into India.

period are the participation of private sector in defence procurement and streamlining these procurement processes and introducing professionalism within the forces. Integrated and joint structures were introduced within the organisation. Joint forces exercise within and outside the state is being conducted to strengthen the reforms. The formation of headquarters Integrated Defence Staff has had a significant role in adopting an integrated and joint approach within the defence forces.

The Indian army's *Operation Parakram*[7] and Kargil war made the defence forces rethink about the changes to be adopted in the defence doctrine. A new doctrine had to be formulated as the forces realised the need to streamline the industrial age formations. Mobilisation of forces had proved difficult in these operations (Saighal 1997). The features of RMA are clearly visible in the new doctrine. The new doctrine is focused on maximum enemy penetration and speed in execution of tasks. The concept of integrated battle groups assigned with specific task is envisaged in the new doctrine. The Chinese concepts of war zone campaign, their rapid reaction forces and elite forces have been compared with these Indian concepts at some levels. The Indian doctrine calls for an integrated services environment within the defence forces. In the case of the naval forces and of the air forces, the need to operate as joint services has been stressed.

In the Indian Army Doctrine of October 2004, 'RMA' is termed as a drastic change in the nature of warfare brought about by innovative application of new technologies which combined with dramatic changes in military doctrine, operational concepts and operations, fundamentally alters the character and conduct of military operations (Anand 2006). In accordance with the above doctrine, the Indian Armed Forces have focussed on innovative concepts in conducting military operations, in formulating military doctrines, integrated command structures within the organisation along with professionalism; strong $C^4 I^2$ SR systems (Command, Control, Communications, Computers, Intelligence, Information, Surveillance and Reconnaissance), strong information warfare capabilities and effective network centric warfare methods. There is focus on force multiplication of air and surface forces through achieving long range precision strike capabilities, Unmanned Aerial Vehicles, advanced sensors and space support programme.

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[7] *Operation Parakram* is the largest mobilisation of armed forces along the border to contain infiltration in December 2001. In *Operation Parakram*, the armed forces returned without waging war.

The formal Indian Army Doctrine formulated in 2004 was based on a deep study of the United States armed forces and their coalition partners in their recent campaigns. The doctrine exhorts the forces to be vigilant anytime for any conflict terrain. The formulation of such doctrines highlights of the RMA influence in Indian defence thinking. Military doctrine is an essential part of a military roadmap as this doctrine acts as guidance to the forces. In April 2006, a Joint Military Doctrine was adopted as a step ahead in modernising the Indian forces. The major purpose of this Joint Military Doctrine was to achieve interservice synergies which are also part of RMA (Oberoi 2003). RMA is not just a technological advancement but also it also the co-operation between the different branches of the states' defence framework.

Speed of action or reaction and operational readiness has been emphasised within the Indian forces as the next challenge that it has to tackle. This issue is expected to arise in a full spectrum of conflict which could be anywhere – on both sides of the international boundary or the line of control. The nature of conflict is likely to be a cross border terror strike, economic offence or a low intensity conflict. The Indian forces are developing defensive as well as offensive warfare tactics to confront the next conflict situation. With the existing advanced technology the Indian military research and development plans aspire to develop weapons, which are an unlikely possibility in the enemy arsenal so as to achieve the winning edge by advantage. The development of electro magnetic spectrum is regarded to be a part of this strategy.

Before the First World War, warfare tactics were limited to horizontal expansion but later on the vertical dimension of warfare began to be explored and now it has a very significant part in winning conflicts. Developing space capabilities are predicted to be of very significant in the coming years as space is being considered as the next conflict zone. Though there are international treaties prohibiting space assets, there is growth potential that can be viewed in this area. Space technology becomes important for communications; reconnaissance capabilities like using imaging sensors, radars, electronic and signal intelligence and navigation. The Indian capability for exploitation of space is modest and still emerging (Lal 2001).

India is witnessing a boom in Information Technology. The Indian Defence establishment is placing heavy emphasis on development of Information Technologies as it is set to benefit from this boom in the IT sector. Information

Technologies are considered the core of the contemporary RMA capabilities. Along with exploiting the information technology capabilities, there are plans to develop an enhanced $C^4 I^2$ SR system. The overall plan is to develop an Integrated Defence Communication Network in addition to individual service networks that can connect and allow responses to national emergencies and crises by the joint services at a strategic level (Lal 2002). The final objective is to have an integrated network at the operational level to enhance the combat power. The Indian forces are also developing network centric warfare capabilities to maximise their warfare capabilities.

The development of information capabilities are being introduced in the air force and naval forces. To enable the air force to access to high speed connectivity to all the entities, an enhanced Wide Area Network (WAN) with adequate bandwidth have been set up. To give pilots and other forces accessibility to the satellite pictures in real time, an imagery dissemination system is also being developed through the defence connectivity network. This system is expected to process information from different operational areas into unified operational data which will increase the awareness about situations. The Indian Navy's primary missions are the protection of vast exclusive economic zone, sea lines of communication, long coastline and the outlying territory. Among the Indian forces, the naval forces were the first to incorporate information technology enabled networking and e-enabled solutions. The visibility of all assets was one of the aims of the naval forces in incorporating the IT technologies. High speed connectivity between shore establishments, offshore platforms and logistic installations were also part of this aim (Mookerjee 1997). Inclusion of technology into the naval forces has changed the offensive and defensive balance of the forces. The Indian Navy is supposed to acquire effective defensive deterrence power in the Indian Ocean.

As stated above, network centric warfare is emphasised within the defence forces. The platform centric warfare is being diluted for achieving a network centric warfare approach. The fundamental objectives of the network centric warfare approach is to enable the connection between sensors, information processing, decision making and shooters in a common grid so as to improve the mission effectiveness, response to enemy forces and speed of command. The network centric warfare focus in India is on increasing the combat power by linking war fighting machineries and organisations. The benefit of adopting network centric warfare is that it can increase the operational efficiencies and speed of both traditional and other

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capabilities of the defence forces (Anand 2000). Smaller units with greater combat potential are being considered very much by the army. The three forces of the Indian defence forces have recognised the benefits of network centric warfare and have introduced systems which can improve their connectivity.

The forces modernisation can also be seen in the non-technical sections of the army. The intake of officers with technical background has increased and soldiers are being given training in multi-tasking. To pursue these issues, a National Defence University has been established. Higher level officers are also given training to learn the change in doctrine, security and technology.

Technological diffusion

RMA is the synergistic combination of doctrine, strategy, and organisation and of innovative technology. Doctrine, strategy and organisation are components which have to be structured according to a state's condition. One important condition to be achieved by a state to pursue a substantial RMA is a self sufficient, self reliant defence manufacturing industry. This may seem to be a non affordable and impractical goal but in India, self reliant defence industry has been a national goal since its independence. Technology is a very significant factor in the RMA and achieving this factor has been posing difficulties for developing states till recent years. Technology has gained access to the defence production of these states through the process of diffusion. By diffusion, it is meant that technology began to be available for defence purposes through the commercial or dual use, through the weapons procurement policies and through the employment of scientists from developed states.

The environment regarding the transfer of technologies has changed drastically since the 1990's. The end of the cold war era has brought down the barriers between the eastern and western states. Secondly, with the globalisation, the distance between states has been reduced very much. Thu, the passage of people and technology through the borders is taking place without much hassle as before. The internal environment has also changed very much in the case of technological controls. There has been a major shift from the government or the traditional representatives to private players in the new market economy. The government is also an actor in the whole sequence involved in obtaining technological know-how. In the

twenty-first century, international firms are responsible for the mass output in defence products. Sub contractors and subsidiary companies through out the world have begun to participate in state research and development and the monopoly of the state in defence production has come down. The growing international market and access to it has improved the quality of equipments in most of the states of the world. The 2001 anthrax scare led to the renewed attention on the non-proliferation regimes and diffusion of sensitive technology. The multilateral export control arrangements, Nuclear Suppliers Group (NSG), Australia group[8] and Missile Technology Control Regime (MTCR) – all were based on similar background to prevent technological proliferation (Gahlaut 2002). These control regimes can affect the acquisition of dual use technologies by other states which are not its members though the emerging market and demand forces for defence products are considered to be equally strong.

After independence, the Defence Science Organisation was set up which later grew into the Defence Research and Development Organisation (DRDO). The DRDO today is a thriving organisation with 52 laboratories established throughout India. The objectives of the DRDO are to achieve self reliance in defence production and to develop expertise and emerging technology for future. In the post independence scenario in India, the defence industry was sorely a government sector with complete ownership to the government and no role for the private sector. The needs of the Indian armed forces were delivered by the Ordnance Factories and defence PSU's. The systems needed were sometimes imported but with the collapse of the Soviet Union, the defence forces suffered acute spares shortages. An example is the Mig 21 which was under production in India and suffered from the Soviet collapse (Jayal 2001). When new challenges emerged on the defence production front, to stand up to the competitiveness around, the government decided to allow the private sector 26% in the defence sector.

Today, weapons systems are not unique national products but weapons contain systems and components which are sourced internationally and some are even customised to suit the requirements of the customer states. This has introduced the Indian defence PSU's to new opportunities so that they can exploit their core strengths and acquire more in partnership with international firms. Integrating civil and military production, design and development in selected areas, component and

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[8] This group was initiated by Australia in the 1980's to prevent the proliferation of technologies which could enable the production of chemical and biological weapons.

system manufacture, repair and overhaul of civil and military platforms, integrating and testing of avionics and weapons systems and writing and updating software are some areas where the strength of Indian PSU's lie (Jayal 2001). In states like Russia and China, the use of western engines and avionics can be seen. In the developed western states, the defence research and development are reaping the benefits of the commercial world. In these states, it is the commercial world which has been driving the technologies like computer advances, electronics, material sciences, genetic engineering and so on. In terms of man power, India possesses a high quality of scientific expertise and technical manpower. Yet the Indian scenario has not been able to utilise them fully. This has been attributed to Indian scientists taking up lucrative assignments in the West.

The acquisition of technologies for defence purpose is not an easy task. The development of aircraft, air defence systems and helicopters with imported technology could end up in billions of dollars. It is not only affordability which determines the availability of the foreign sourced technology but political factors that are involved in such processes. Exporting of technology is also another matter concerning the foreign sources. Today, there is a clear distinction between the states with advanced technology and the others. The advanced western states have evolved restricted regimes to track and control the technological proliferation. Some of them are the Nuclear Non-Proliferation Treaty, Missile Technology Control Regime and Intellectual Property Rights Act to prevent the transfer of critical military and dual use technologies (Rastogi 2003). The only way out of these difficulties are perceived to be the growth of indigenous developments and balanced imports.

The dual use technologies are a boon for the defence production. Technologies which can be applied to military and commercial sectors are commonly known as dual use technology. Dual use technology has brought in a synergy between military and commercial sectors. Dual use technologies are evident in electronics, avionics and chemical industries. Some military applications which have found their way in to non military use are the following: satellite technology which has enhanced the entertainment systems and communication systems and surveillance systems are used to monitor pollution levels and agricultural outputs.

In China, the Commission of Science, Technology and Industry for National Defence (COSTIND) was created in the 1980's as a joint military civil head quarters to look into the defence industry and to into the PLA. In 1998, a national level

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headquarters called the General Armaments Department (GAD) was introduced in the place of the old COSTIND and a new COSTIND was set up. The function of the new COSTIND was to discharge government policies and to manage defence production and conversion. The GAD, along with the new COSTIND was to work closely to take care of the requirements and standards of defence production. In 1999, five large defence corporations were divided into two new corporations to increase the defence production competitiveness in the market economy. In China, the electronic industry is not a part of its defence industry but was merged into China's former ministry of posts and telecommunications to the present Ministry of Information Industries. Though the reasons for this merger are not stated clearly, the electronic industry is the foundation for RMA development and economic growth. The 1990's also saw major developments in the communication systems in Chinese society and defence circles.

In a speech in 1998, the Minister for Science and Technology of China emphasised on the importing of main technologies and introducing innovative ideas in the sphere of Science and Technology (Blasko 2001). This speech has implications for the civilian as well as defence industry as both are intermingled. Analysts on China have been able to detect the dual-use technology approach of China in defence sectors. Such an early attempt has been pointed out in the 863 programme. The 863 programme is a combination of the civilian and strategic programmes which focuses on seven areas for their long term development. These areas were space, lasers, automation, biotechnology, energy, new materials and information systems. Most of these areas were left under the civilian control and only two of them were undertaken by the Chinese defence sector.

The Chinese industrial sector is credited with a capable sector which can produce equipments on their own. This is true but the outmoded technologies have to be revamped to continue this again. The industry is still capable of producing certain missiles and electronics but on the whole, a new and massive technological input is necessary to have weapons on comparable efficiency with the advanced forces of US and European designs. The long term goal of the Chinese defence industry is to acquire technology transfer to improve the domestic production capabilities and the short term goal is to cater to the domestic needs by acquiring foreign technology sources. Though there are desperate attempts to continue this goal, the Chinese leadership's underestimation of Chinese defence forces came at this juncture. Beijing's decision in the last decade to acquire defence equipment from Russia -

destroyers, cruise missiles, submarines, helicopters, fighter and transportation aircrafts and surface to air missile systems - which were also being manufactured in China has been a let down to the defence industry of China.

In the case of technological proliferation issues, China has a sophisticated export policy. The Chinese ordinance company which supplies the PLA with equipments is suspected of owning subsidiary companies in the United States. In cases where the Chinese government is unable to procure technologies, they identify the firms which supply the sub components of the equipment and then pursue their interests (Saighal 1999).

RMA development in China and India: An Analysis

The major security concerns today which have led to the development of RMA capabilities are factors like strategic and economic interest of United States in the Asian region, emergence of China as a major military and economic power, Russia's new diplomatic ventures aiming at new strategic alliances, increasing economic importance of the Asian countries and the border line conflicts existing between many major powers. The major states in Asia today which have the calibre to grow into future military powers are China and India. Both these states are growing economic powers of the twenty-first century. The progressive economic returns from trade in these states have been helpful in directing these states towards RMA (Bhat 2002). China is a vast land with serious ethnic problems in its periphery with Taiwan and other states and uneven economic developments within the state, though the overall economic growth of China is very impressive. In short, China occupies a central place in the Asian region. China's economic development is considered to continue, opening new avenues in China in the name of globalisation. The growing economic clout could make the regional stability more critical. The major reason behind this can be stated as China's growth which is viewed by most of the states in Asia and by the US as a de-stabiliser with hidden regional agenda. In the post Cold War era there have been growing differences between Washington and Beijing, the major reason behind this being the conceptual differences in political decisions (Murthy 2000). This has led to the situation where Chinese forces had focused on acquiring inter continental missiles. China also has a turbulent neighbourhood and is facing frontline disturbances from the western region.

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India on the other side is mainly concerned with the security threats emanating from its neighbouring states. The threat of intrusion into the Indian mainland from Pakistan and from China has been a cause of concern. The US's interest in the marine resources in the Indian Ocean region and India's assumed intention of the US to create a military base in the South Asian region is also viewed as a security concern by India (Nambiar 1998). India's vast coastline has made the Indian defence research to be more focussed on equipping the naval forces with advanced technologies. The infiltration of terrorists across the borders had forced the Indian defence forces to be more vigilant on the state's frontiers. The economic progress from the mid- 1990's had allowed the government to allot more funds for defence research (Singh 1999). All these factors have together enabled India to pursue the aim of improved RMA capabilities. The reluctance on the part of many western states to share better technologies had resulted in the search of domestic technologies in the field. In the technological front, both China and India have made major advances compared to the other non-western states. China and India had wisely pursued an effective communication network system in the civilian sector which has been of great advantage in the defence sector.

The pressure of the peer competitor in pursuing the RMA has a significant role in the states developing advanced RMA capabilities. China is considered to grow into a peer competitor for the United States in the coming years (Swaine 2000). The economic progress of China is said to be the enabling factor for this. With the neighbouring states of China and India starting to acquire RMA capabilities, the scenario has changed. This is yet another reason for developing advanced military capabilities. The military capabilities that have been advanced by China and India may have certain similarities like an industrial age force structure (prior to modernisation wave) though; there are great disparities in the military capabilities of China and India, especially in the matter of force projections. The Indian defence forces power projection is less aired than the power projections of the Chinese defence forces. The Chinese has sufficient quantity of literature available on their force projections and proposed revolution in military affairs. There are immense materials on the Chinese perception of future wars but at the same time, the data on the ongoing weapons makeover or acquisition and real technological advances are kept in secrecy and this has become a limitation in research in Chinese RMA. Some analysts have come up with the view that the large quantity of literature is another

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strategy for the power projection of the Chinese military forces. These states have stressed their modernisation programme on all the components of the RMA, namely, at the doctrinal level, organisational level, tactical level and at the technological level.

A detailed analysis of the international defence procurements between states will make it clear that the development of the contemporary RMA is on a large scale influenced by the diffusion of technology. The technological diffusion cannot be controlled owing to the wave of globalisation. The acquisitions of RMA weapons are being pursued by almost all the states that have political motivations. However, there is hardly any discussion about the probability of their use. Most of the states acquire these weapons as a deterrence strategy.

Chapter IV

THE EFFICACY OF RMA IN NON-WESTERN STATES:
COMPARING CHINA AND INDIA.

Technology has always interacted with innovative warfare methods and in the twenty first century, technology holds the power to change not only warfare means but the whole concept of war. With the concept of RMA entering the warfare scenario, war has become complex in terms of management. The speed of operation with the effect of bringing in the collapse of the enemy forces has become the prime endeavour of the forces in the twenty-first century. Major studies on the concept of RMA had focused on the western war fighting capabilities, non-western war fighting capabilities and on other armed movements in the western and in the non-western states. The conceptualisation of the western and non-western war fighting capabilities under the same frame work would be inappropriate as most of the western wars are directed against the non-western states and the western ways of waging war have deep impressions on the development of non-western war fighting capabilities. The present era has been regarded as an era of military globalisation by David Held and his colleagues (Shaw 2005). This is because the new wars which have been fought have a significant role in globalising military affairs. The trends in the military relations all over the world are changing. The three main features which are strongly visible are as follows: (a) rise in regional rivalries along with the decrease in rivalries between major powers with rising military power of the U.S; (b) there are large numbers of states capable of weapons manufacturing capabilities which were not so before. The arms trade has also expanded with the transnationalisation of western defence industries; (c) international Institutions or better called as international security regimes have started coming up in order to manage the volatile nature of war (Shaw 2005).

These features of the contemporary world has enabled changes in states other than the western states to pursue advanced military technologies though there are limits imposed by the international security regimes on particular programmes. The shift of the western forces from the industrialised to the smaller professionalised forces is more the influence of cultural forces than technology (Shaw 2005). After the cold

war, the change in the targets and the need for small armies made them shift their perspective on war. Potential developments on the military front started taking place after the Cold War as the practicality of waging war was realised. The major powers started amassing weapons and the opening of markets helped ease the tensions between states as dependence began to play a crucial role in relations of the state. Economic interdependence began to model state to state relations. This is the world state of affairs when military globalisation began occurring. The rivalries between the western states ceased while their military industry started opening up. New regional and international institutions have emerged since with the aim of controlling the growing military advancement.

The changes adopted by the West have been noticed worldwide. These effects have been visible in the other states. The development of smart weapons by the western states has an increased influence on the non-western states in building smart weapons. In the recent wars fought by the western states, they have shown stark deviation from conventional warfare tactics, strategy and weapons. Even the causes for which the western states have gone to war have changed dramatically. The reasons cited by the western states while intervening militarily in the other states are more in the nature of responses to the conflicts in the non-western states. Though the recent war initiated in Afghanistan has been reasoned as the response to the attack on the US, generally the western interventions are reasoned as designed for constituting a better and democratic world without regimes that support terrorism. There are different interpretations for these interventions in other states. Critics have been pointing to political ambitions and resource crunches as motivations behind these wars. These interventionist policies adopted by the western states are referred to as 'new imperialism' by the non-western states. This has amplified the threat concerns of the non-western states especially of the third world states and has led to the possible imitation of the western RMA in non-western states. As compared to the non-western armies, the armies of the western forces have relatively smaller professional armies with reliance on more specialised high technology weapons and their wars even end without territorial occupation.

RMA can exhort states other than the RMA advanced states to either pursue the RMA capabilities in full as in the West or else to formulate a state specific RMA conditioned according to the threats perceived by that state. The introduction of the contemporary RMA capabilities into the defence forces of a state is time consuming

and expensive. RMA as stated before is not only the induction of advanced technological equipments in the forces but also organisational changes and structural changes. Another response to the contemporary RMA weapons is asymmetrical approaches. The RMA capable states of the West are mostly averse to casualties but states with low RMA capabilities are willing to accept casualties. This could motivate the other states to pursue asymmetric warfare capabilities. The asymmetric warfare capabilities include the amassment of Weapons of Mass Destruction (WMD), network centric warfare, bio terrorism and chemical weapons. Asymmetric warfare can include any capability of the enemy to strike at the target. Sometimes, it is difficult to explain asymmetric warfare.

The developing states are said to have more opportunities to exploit the RMA weapons than acknowledged. This is because the defence industries market technologies have RMA attributes like advanced battlefield systems and covert network surveillance software. The falling cost and availability of electronic chip is another factor favourable for the developing states to pursue RMA weapons. Though the wide array of information technologies attached with RMA capabilities will not be affordable for the developing states, sparse capabilities can be achieved. For more progressive developments, economic support, infrastructure and expertise would be needed. Even with these limitations, most of the developing states would opt for the limited development of RMA capabilities as in the twenty-first century it is almost a norm to have a professional military (Shaw 2005).

The understanding of the nature of warfare in which a state is expected to operate and also the understanding of the nature of the warfare methods pursued by the potential enemies are significant factors which shape the new methods of warfare. Those states which understand the contemporary revolution in warfare can exploit their benefits. At the same time, these benefits remain only till new counter strategies are developed. Once a revolution in military affairs asserts itself, the counter strategies will be explored as quickly as possible. Though the contemporary RMA has opened new avenues in warfare tactics and methods, it is also vulnerable.

As discussed in chapter two, there are four major schools of thoughts regarding the contemporary RMA – the system of system school, the dominant battlefield school, global reach global power school and the vulnerability school. The responses generated by the western RMA capabilities are the central concern of the vulnerability school. Apart from the other two ambitious schools of thought, the Vulnerability

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school's concerns are not ambitious but it throws caution at the soaring development in RMA capabilities (O' Hanlon: 2000).

The vulnerability school of thought emphasises on the diffusion and proliferation of technology from the western states to other states. This school of thought frequently invokes the concept of asymmetric warfare. The concern here is that the adversaries of the United States may not strike with the same way but differently which could cause heavy casualties. They believe that the threats could be in the form of threats posed by enemy's RMA build up like enemy ballistic missiles, antiship missiles, satellite technologies for jeopardising communication network, chemical weapons and biological weapons. As there has been no campaign in the non-western states including the contemporary RMA character, the appropriate way to study the efficacy of RMA in non-western states is by studying the approaches advanced by them and the present deficiencies in the forces.

The efficacy of RMA in China:

The 1991 Gulf War made the Chinese PLA become aware of their deficiencies in warfare methods. In the period before that the PLA had estimated that the future adversaries would be medium or low level technological forces. The high technology used in the Gulf War left the PLA planners highly aware of the inherent deficiencies of the PLA forces. The 1991 war precipitated into the PLA in the form of changes in doctrine – the old doctrine gave way to the adoption of limited war under high-technology conditions. Until that period, man was the centre element of the PLA army but after that, it was occupied by technology and weapons. The Chinese military then focussed on acquiring capabilities like electronic warfare, improved ballistic missile production, laser technologies, early warning and command systems, artificial intelligence, precision guided munitions, in-flight refuelling and information warfare methods. Though the Chinese approved of these changes, they were financially and technologically not well prepared (Kelly 2006). The awareness of these deficiencies led to the debate of whether to go indigenous production or to buy from abroad. Thus China began to buy from Moscow. The PLA assimilated knowledge quickly from the defence transfers from Russia. The goal was clear – to have a multifaceted, technologically advanced force which is capable of multiple missions (Shambaugh 1997).

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The interoperability of forces in the PLA posed a critical problem as there was an inability to conduct joint operations. In the 1980's reforms were initiated that created group armies for easy mobilisations but even then the forces were largely dominated by ground forces. Their reforms failed to bring in a flexible brigade which could quickly act in all weather conditions. The significance of an army was dependent on the quality of the army and the technical capabilities it had. The size of the army did not matter anymore.

The PLA attaches great significance to knowledge; knowledge had begun to find a high place in combat power while other powers like mechanised power began to take a secondary role. Within the PLA, writings on Information Warfare as an offensive power have been divided into soft and hard Information Warfare. As soft Information Warfare, the Chinese emphasise on confusing and paralysing the enemy's communication systems of all three forces combined together. As hard Information Warfare, the emphasis is on disrupting the enemy's logistics and reducing the enemy capability to respond to offenses. The use of soft and hard Information Warfare (IW) is envisaged by the Chinese in order to achieve dominance in warfare and to follow with more of conventional forces. Some writers within the PLA have also written about 'secret weapon' or 'magic weapon' which could lead to Chinese victory by giving them advantage in destruction (Pillsbury 2000).

The IW ideas of the Chinese are not independently developed idea but it is a combination of the IW of the west especially of the United States. The Chinese writings about the RMA have increased in volume and these concepts are also being developed within the PLA. Chinese troops are being given training in the use of offensive Information Warfare though the existence of offensive IW can largely be seen in theory. The PLA forces are being digitised and interconnected as could be seen in the 1998 induction of the first military information superhighway which connected all computers of armies and other forces into a central command. There are investments in the field of space and ground based IW systems (Swaine 2000). There are volumes of work on IW in the Chinese literature. This interest is a reflection of the future ambitions of the Chinese. Graduate training programmes and text books on IW have been introduced in the PLA's Communication Command Academy.

The PLA includes advocates on adopting unorthodox warfare tactics. There are opinions on negating the comparative advantages of the United States by asymmetry; open views on unrestricted warfare have created revolutionary thinking within the

PLA. Though Information Warfare is attached with great significance in the PLA, there are obstructions for the growth of these techniques. Despite the progressive nature of the IW, there are problems in acquiring and introducing these capabilities into the forces. The acquiring and assimilation of these capabilities into the forces is seen as a part of building an effective force structure which can combat the new age warfare tactics of the enemy. There are cultural, political organisational and technical problems involved. The status of information as a controlled commodity, the inflexibility of professional hierarchies, conservatism towards innovation and change in general, authoritarianism and self reliance are considered to be the impediments in China's progress in IW. China's capacity to innovate using indigenous research and development is deeply doubted by analysts in the realm of advanced technologies (Bajwa 2002).

The orientation of the Chinese military leadership is also considered an impediment on the path to success as most of the Chinese leaders adhere to the traditional warfare tactics. It is only recently that this conception has changed. China does not lack in theoretical doctrines and works. It is the operational doctrine that needs to be actively induced into the Chinese forces. More innovations have been made in the Chinese Academy of Military Sciences than the innovations which have been introduced in the PLA. The innovations could take some time in being induced in to the military. Training the military is literally expensive in the case of live-fire exercises and the equipments could also be damaged; so the forces are given war simulations through war games. War games for air force, ground forces and naval forces are produced by themselves. War exercises are also conducted to achieve better performance. Chinese analysts are of the opinion that these war exercises and evaluation should be done at an increased level. Such type of war exercises are considered as standard exercises in the western military but China adopted such practices only in the 1980's. These trainings of the PLA has been criticised as infrequent and oversimplified exercises (Shambaugh 2000). Until recently, exercises were held only in good weather; the weather conditions played a defining role in the PLA's exercises but now these trends are being reversed. The grading of these exercises began only in the late 1990's.

The Chinese forces have shifted their conscription policy to a volunteered policy in order to bring professionalism within the forces. For military proficiency, familiarity and retention levels of soldiers should be high; conscription does not allow

both as the spirit enjoyed by volunteered forces are different compared to conscripted forces. This issue had hampered the progress of the PLA in the 1990's. Not only the induction, but the standardisation of training for the forces also threw in trouble for the PLA in the same time period. This has been pointed as the cause of introducing multiple changes at the same time. The PLA forces have been reported ill-equipped in operating the new equipments acquired; in some cases outside help has been requested because, the forces were afraid to handle the equipment (Ji 1999).

Studies show that PLA's theoretical occupation with modern warfare began to be seen in battlefield from the 1980's. The wars fought during that period did not have co-ordination between the forces though; all the forces had participated in wars. Lack of joint operations among forces and the lack of integrated logistics have been plaguing the PLA.

As an after-effect of the Gulf War, the PLA initiated training with revised doctrines in 1991. The significance of this training was that joint operations were given special attention here. Majority of the exercises involved multi service and joint operations. Ground-air combined operations were also given importance in this training. In 1998, the PLA Navy began training with surface combatants. This training also included the simulated anti-ship missile attack, effective use of helicopter, fire damage and control deep ocean exercises and training at night. The first exercises on the airborne supply operations at sea were conducted in this year (Shambaugh 2000). In 1999, the PLA moved a step further ahead by conducting exercises where surf combatants and naval tactical air units were given training under intense electronic warfare conditions. PLA forces have also undergone training with submarines and anti-submarines.

The Yugoslav War of 1999 has also been evaluated by the Chinese war analysts in order to incorporate techniques on warfare into the PLA. These lessons have been implemented in the training of PLA forces. Reports of training against the advances of stealth aircraft, electronic warfare and cruise missiles in the military exercises are available. Anti electronic warfare and counter Information Warfare are being stepped up; moreover, war gaming[9] is being done in online format also. The Yugoslav War has convinced the PLA that the next attack on China could be a multifaceted attack. As stated before, the war exercises are being conducted in difficult weather and

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[9] War games are games which simulate military operations. war games were introduced in the twentieth century.

terrain in order to increase the mobility of the forces. Night time exercises are also being conducted. Since 1999, amphibious exercises are on an increase. The important cities within China are improving their anti-aircraft skills and air defence skills. Exercises on how to sustain a chemical attack are also under the focus but the top priority has been attached with electronic warfare, counter electronic warfare and Information Warfare.

Training of Special Forces is also undertaken. These special forces are specialised in different operations and are equipped with global positioning systems, 5.8 mm sniping rifles, air foil parachutes, special helmets with night vision and bullet proof vests (Pillsbury 2000). Though these training operations are taking place, critics are of the view that PLA lacks a real national training centre. In 1999, a new combined arms tactical training centre was opened where three dimensional joint operations are encouraged within large space but critics are still of the view that the PLA does not have the facility for innovative joint training.

The recent years of the PLA gives us the impression of awareness with the RMA. The revisions and reforms within the PLA is a strong implication for the presence of the RMA concept within the PLA. The grasp of the Chinese on the contemporary warfare methods can be deducted from the changing doctrine, strategy, training and tactics. Changes can be seen not only in theoretical issues but also in practicality. These can be considered as positive attitudes but the PLA still has insufficiencies like incompatibility between the forces which could hamper the joint operational structures, there is a relative lack of air and sealift capability, low capability in countering electronic warfare and Information Warfare though the Information Warfare capability has a better status, low amphibious capability, fragmented logistic system and vulnerability towards precision guided munitions. The PLA's equipments and technology have been regarded by critics as insufficient for the high-tech doctrine that they uphold. There has to be an improvement in existing equipments technology. Their ground forces need to be incorporated greatly into air dominance which they still have to improve upon.

The PLA leadership is aware of the limitations that there is a large gap between the aspirations and the capabilities. When comparing the PLA's developments in the last three decades, we find that modest developments have occurred with qualitative changes which are counted as impressive.

The efficacy of RMA in India:

The Gulf War of the 1991 has been considered as the transitional point as the forces of industrial age forces and the new age warfare can be seen in combination in this war. This warfare tactics centred on the disruption of the enemy command and communication systems and is based on superior knowledge. From the Gulf War, the strategic importance of developing a knowledge based Information Warfare has been realised. Toffler terms this new warfare as the third wave of warfare which has come into existence after the second wave of warfare or the industrial age warfare (Toffler 1994). As in the case of China and many other states, the Gulf War has been the war from which all states have taken lessons.

The information age in warfare has led the forces into focusing on the objectives of destruction of information systems of the enemy. During the industrial age, warfare objectives revolved around mechanisation of forces and targeting the resources of the enemy. Alvin Toffler argues that information technology in itself is seen as a balancing element as it can be used by both the affluent and poor states in military affairs as defensive and offensive warfare method. This could be the reason as to why most of the countries are developing information warfare technologies. Both India and China has begun to develop information warfare technologies. This can be inferred from the extent of literature available in the military articles on pursuing information warfare capabilities. Defence budgets could mostly linger on acquiring information platforms like airborne warning and control systems, JSTARS and satellites. When using information warfare techniques, the victory would depend on the quickness of action which includes decision making, observation and orientation. Also by the use of information warfare techniques, targets could be achieved with low casualties.

The main strength of India in the present time are economic boom and technological progress. The performance in these two sectors has been predicted as major capability of India in harnessing the growth of the defence forces. The efficacy of RMA in India would depend on the capability of Indian forces in developing advanced technologies and importantly, adapting them into the forces. The new mode of warfare has also emphasised the need for new doctrines and policies. With the dramatic changes in the battlefield, states are finding it increasingly necessary to adopt offensive methods of warfare more than the defensive warfare capabilities or it

seems effective to project the offensive capabilities. The new age doctrines do have the tendencies that could lead to the formation of offensive Information Warfare capabilities.

The future wars are predicted to involve the C^4I^2 systems. Instead of developing a common and integrated C^4I^2 system the services are developing individual systems. These communication systems developed individually would not be able to serve the purpose of an integrated command system which could eventually lead to the failure of the forces. Electronic warfare is another area where the joint actions of the forces are required. The IW and electronic warfare are the defining methods of warfare in the twenty-first century which requires technology and integrated approach at the strategic and operational levels (Vadhyar 2003).

The 1991 war has made states give more importance to air strikes. The importance of the air-land approach to war has been understood by the Indian forces as the army and air force but these are areas of dissonance between them. The Indian army forces support objectives of Close Air Support (CAS) which is basically the use of aircrafts in land and sea operations. While the Indian air forces are of the view that CAS activities are expensive for the air force and thus they support the limited OAS or Offensive Air Support (Oberoi 2003).

The post Pokhran-II efficiency efforts within the army have been advocating the downsizing of the army personnel. The downsizing of the army personnel is argued as one of the quality changes which have to be introduced so as to usher in the contemporary RMA. The future combat soldiers would need to be skilled personnel rather than an ordinary soldier. The introduction of new technical equipments will also need forces with knowledge about such operations.

After the 1991 Gulf War, the need to reinforce joint operations in the forces has been realised by the leadership. The excellent example of joint operations could be seen in the air operations in the 1991 war. The problems which are being faced by the air forces are the organisational hierarchies, communication and interoperability. There are visible gaps created by the lack of coordination and joint operational doctrine as well as technological deficiencies in the Indian Air Forces. The forces have not remained idle about these shortcomings as in the year 1997; the Indian Air Force came up with a doctrine in the form of a book. In 1998, the Indian Army forces followed with an army doctrine and the Indian Navy is reported to be giving shape to a doctrine suitable for them. At present, although individual doctrines are there, the

defence forces of India do not have a joint doctrine for all the three services on conventional, non-conventional warfare and on Low Intensity Conflict (Anwer: 2002).

The existing Indian defence organisation has been a carry over of the United Kingdom defence organisation when India was subjected to its rule. Modifications have been introduced in the organisation; the current defence structures which helps in the functioning of the defence forces can be presented in three tiers: the defence policy makers which comprises the Cabinet Committee on Security and the National Security Council; tier two consists of the Ministry of Defence which includes the Defence Minister, Minister of State for Defence, Minister of State for Defence Production, Chief Of Staff Committee and agencies which interpret the defence policies; and the third tier consists of the headquarters of the three forces which execute the policies. The institutions like National Defence College, Defence Services Staff College, College of Naval Warfare, College of Combat and College of Air Warfare are expected to play lead roles in the task of attaining joint operability within the forces. In trainings although a joint session of eight weeks do exist, higher training of forces are being conducted individually (Anwer: 2002). This should be changed and more joint training for the forces should be incorporated.

The Indian defence structure has been considered as an emerging force from an outmoded structure which was not followed anywhere in the world. It is high time more modernisations were introduced within the forces. The main problems glaring at the Indian defence organisation are that there is low level of co-ordination between the policy makers, multiplicity of control and that there is a lack of dynamic innovations within the forces.

The Ministry of Defence (MOD) is the ultimate power in decision making organ of the defence forces but the execution of these policies is not the part of the MOD. Thus the organisational realities which pop up during the execution of the policies are not directly related to the policy makers. The accountability of the defence forces or the full responsibility of the defence forces are on the Chiefs Of Staff who are devoid of financial and administrative authority. The decisions of the MOD are said to have been the decisions of the individual forces. There are criticisms that the MOD in fact has very little role in decision making. Recommendations for the meaningful interaction between the individual force heads and the MOD at decision making levels are suggested by critics. At present, there is a triplicity of command

within the forces. There are ministerial, bureaucratic and financial commands on the forces which have been argued as essential in a democracy but these controls are more supervisory in nature which could hamper the speed of the forces in translating policies into actions. The Indian defence forces have waged wars before but the lessons which have been learnt in the past wars have not been rectified. The updating of the defence organisations have been reportedly low (Anwer 2002).

During the years after independence and for some time thereafter, the co-ordination of forces was deliberately not encouraged fearing a seizure of political power by the forces. The three forces were made into individual forces which had no holistic approach towards war fighting and defence problems. The defence structure of India had envisaged the need for joint working of the forces. However, even after the Kargil War the force structure underwent little changes. The emphasis at the institutional level to improve and inject joint operations and co-ordination of services are also met with implementation delays.

There is a need in the Indian defence organisation to acquire new warfare equipments as the forces have more of the traditional military hardware. The military hardware like tanks, manned aircrafts, surface ships and submarines could become the most vulnerable and difficult to survive in the new warfare. Future weapons which would set trends would be precision guided munitions, tactical ballistic missiles, Electro Magnetic Pulse (EMP) weapons and IW. To shift the Indian forces in to the RMA path, there should be an overhaul of doctrines and existing weaponry. Advances in the technological front would prove inevitable and this in turn would create a need to professionalise the forces. The equipment acquisition would increase the intake of individuals who can handle technological weapons and equipment acquisition would also bring in the need for highly specialised multifarious training sessions (Cowan 1998).

Experts are of the opinion that India would face Low Intensity Conflicts (LICs) as the disturbances within and outside the state is occurring at alarming rates. With such security environment, the joint doctrine needed for the forces has yet to be developed though each force has come up with individual doctrine. Recently, the need for unity in command has been realised and positive steps have been taken to ensure that. Integrated Defence Staffs have been established but without a Chief of Defence Staff along with a joint staff structure which includes senior officers has also been created. Two integrated tri-services have also been formed recently. All these changes

have been adopted to integrate the tri-services in order to achieve synergy in future military operations. The role of the Chief of Staff Committee has been enhanced since 2001. It is the top forum of the forces where they come together; enhancing its role and functions are again another step ahead in co-ordinating the forces.

Some of the problems that plague the Indian forces are outmoded and cumbersome regularity systems, shortages of advanced weapons systems, poor inter agency co-ordination, inappropriate support systems, strong institutional resistance to reforms and lack of joint operations and training. There is a need for upgrading technology like electro optical sensors, navigation systems, electronic warfare and smart munitions.

Computerised wargaming is an accepted method of training in the modern armies. With the advances in the field of computers, it has been possible to bring in wargaming into the forces. These are perhaps the only way to access and get accustomed with new weapons which have limitations in being introduced into training because of the expenses incurred in acquiring the necessary technologies. In the Indian defence forces, computer wargaming was accepted during the 1980's. The first wargame developed was the battalion level wargame rel 1.2^{10}. Computer wargaming as a training tool is considered helpful in the present circumstances (Mamik 1998).

The DRDO in India is reported to be fashioning effective weapons systems. The operational benefit that the DRDO is hoping to achieve is by introducing weapons which would be effective and also scarce in the enemy's camp. The development of Electro Magnetic weapons and exploitation of space as a battle field is in progress.

The recent developments on the acquisition of RMA capabilities can be deducted from the new defence procurement policy which is to be adopted by August 2008. This new defence procurement policy would allow purchases without delay and increased transparency in defence deals. The last defence purchase policy was initiated in 2006 which was aimed at reducing the delays encountered in defence purchases. The 2008 defence purchase policy is expected to help the indigenous production capabilities. The policy is reported to include Indian companies in

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[10] This is the first war game introduced to the Indian forces.

designing and producing equipments which are hard to obtain and closure of dead deals.

The responses to the western RMA can also occur in the form of non-contact warfare. This concept of warfare is not new in the defence circles. The technological innovations and capabilities have allowed the renaissance of non-contact warfare in the twenty-first century possible. There are two operational platforms for the non-contact warfare – one is on the psychological level and the other is cyber warfare. The Chinese are of the view that states which do not possess advanced RMA capabilities could use the asymmetrical warfare methods as a viable strategy. India on the other hand is developing Information Warfare tactics; there are reports that states like China and United States are using Indian software expertise in developing their cyber war software and techniques (Sahgal 2003).

Among the Asian states, China and India are perceived as growing economic powers which can pursue military reforms in order to develop their military powers. These states are expected to have threats arising in the form of low intensity conflicts. The modernisation wave waging within the Chinese and Indian forces are on a big scale pursued in the shadow of their economic power. The problems of redefining a mass, industrial army into a modern professional force on the lines of RMA can be clearly visible in their plight towards modernisation. The modernisation efforts of India are mainly concentrated on force reduction, enhancement of Information Warfare capabilities, funding for new weapons and acquiring new technologies through defence deals. Though the force modernisation in India is comparatively slow than its Chinese counterpart, though there is a very strong attempt at revolutionising the defence forces with RMA type weapons. The Information Technology which is a defining factor of the Indian economy is being harnessed into forming defence capabilities as offensive and defensive. The technological edge acquired by China and India are effectively being merged to enhance their defence capabilities.

In the realm of written literature, we find that Chinese has immense articles and books on developing the RMA capabilities while in the Indian case there is paucity in literature. There is vast amount of work on the Chinese IW tactics which are considered to be adapted in to the forces; some analysts are of the view that by producing large amounts of literature on RMA, the Chinese are in fact orienting their forces toward developing RMA capabilities. The concept of RMA has gained awareness in the Indian defence thinking as this is obvious with the recent strategic

technological deals which the government is a part of. The efficacies of China and India in RMA are on the evolution path; there are effective initiatives taken by both the states in the same direction. The RMA capabilities initiated by them are defined by their threat concerns and available technological infrastructure. We can see that both these states are increasingly concentrating on the asymmetrical efforts within the RMA. The acquisitions of these capabilities are relatively easy than acquiring the typical western RMA and these are also effective in their act; this could be the reason for the increasing interest in the IW capabilities.

CONCLUSION

Is a revolution in military affairs possible for the non-western states? Moreover, if possible, what nature would that revolution in military affairs acquire? Would the revolution in military affairs of the non-western states – in particular, China and India, be able to acquire the same weaponry and professionalism in military affairs as seen in the western states? Is technology from the western states fostering RMA in non-western states? These are the main questions, which has propelled this study on the RMA in non-western states by attempting a comparison between China and India. To analyse these concerns, the causes for the emergence and the efficacy of RMA in China and India have been focused.

The western military forces are surely very advanced than the states in other regions of the world. When the western states are taken as a whole, we can see that the most advanced western state is the United States. The military prowess of the United States can be cited as an instance in arriving at this conclusion. The non-western states in most spheres are not considered as advanced as the western states. The lack of technology and advancement is similarly evident in their military realm as well. When we consider the earlier military occupations, it is innovative strategies of conduct which has led the victorious states. The stunned silence of the war analysts during the conduct of the Gulf War is understandable in this way.

The most significant and the most threatening part of the military innovations is that any innovation would have a counter strike. This development could take time in showing up or could also be a part of the innovation. The Revolutions in Military Affairs (RMA) of the West have set the pace of military modernisation in states where the advancement of the west is feared. There are states which have initiated the duplication of the western RMA to contest local or regional conflicts. These new weapons have improved the scope of actors within the warfare sphere. The western states, with the knowledge of advanced use of technology is on the path of trying to deter technological knowledge to other sates using international control regimes while at the same time, the research and development in West is unhindered. This is a rather

strenuous effort in the age of military globalisation where technology proliferation is a reality.

An analysis of the warfare systems of the West reveals sophisticated systems; it is not that these weapons are not without any deficiencies in performances but when compared with the weapons of the non-western states, these are assuredly known to be superior weapons. Though the RMA demonstrations of the western coalition have not performed as expected, these are studied with high interest throughout the military spheres of the states in order to duplicate these technologies with the available resources. Further advances are expected in the RMA of the West but surely this would be less shocking than the arrival of RMA in the future.

Innovation in military affairs takes place in most of the states of the twenty-first century. Military research and development could actually enhance the status of the state. RMA implies a substantial change in the normal conduct of the military. What the contemporary RMA has brought in is an innovative change with old weapon systems. The conventional warfare systems are very much in practice but with the infusion of new technologies.

The causes for the emergence of RMA in non-western states are commonly attributed to the fear of the imperialist ideas which are persisting in the West. This is true along with other reasons for the emergence of RMA in non-western states. Development of RMA and innovations within the contemporary RMA weapons need economic resources to fuel their growth. RMA can be seen as defined by each state on its own. It is not the definition of RMA as a term – which of course has not reached a consensus but the definition of RMA as defined by the needs of a state. RMA is propelled not only by the fear of confrontation induced by West but there are forces like economic boom resulting in better improved economic resource allocation for military affairs; political ambitions; geographical positions and threat conceptions from neighbouring states which are mostly considered to raise low intensity conflicts. The need to modernise the military also has a more emphasised role in the modernisation programme. The modernisation of military is more of a norm in the globalised world.

In the case of the two non-western states – China and India, technological advances in military technology can be seen as happening at a good pace. The next dimension of war is supposedly the space operations in which both these states have research and projects on the move. The technology acquiring mechanisms of these

states seems to be improving year by year. This is evident from the reports on military research of both China and India. The main area of excellence in RMA in China and India can be considered to be technological advances as the other areas like organisational and institutional changes are comparatively slow in progress. The availability of technological knowledge is comparatively easy in the twenty-first century. Globalisation and privatisation has a key role in military globalisation. The dual-use technologies has truly revolutionised the gadgets used in the military. In both China and India, dual-use technologies are made use of. Another form of acquiring technological knowledge of the western weapon system is by importing limited numbers of weapons and then by studying and duplicating the technologies used. Sometimes only certain parts of the weapon system are targeted for imports and not the whole system. The collaborations with other states and production agencies also bring in the knowledge of new technologies. The MoU's between states also facilitates diffusion of technologies. Most of the technologies obtained and induced in to the army weapons are obtained from the West. Diffusion of technologies in the direction of development of RMA type weapons, from the western states has been taking place.

The RMA which has been initiated by the western states has had an impact on the non-western and western states. The developments in the political and military sphere of states are testimonials to these changes in the non-western states. The changes initiated in China and India differ in this case. Though force modernisations are a way of responding to RMA, there are other forms of responding by developing asymmetric warfare capabilities. The works on Chinese RMA suggests the use and forms of using asymmetric warfare capabilities in future wars. Cyber warfare capabilities are being pursued by the PLA. The responses to RMA have been mixed as there is no uniformity in the response action which has been generated from the non-western states. The strong point of any military is its doctrine. Though devoid of a physical form, the doctrine of a military is what propels it further. An excellent doctrine is like a clear roadmap or a plan. The Chinese forces are aware of the form of war which could strike their territory in the present century. In the Indian case, a join doctrine is only evolving. The need for a joint doctrine is very essential in the RMA context. The delay in adopting a joint doctrine would cause delay in further modernising effect which could be considered as minor but which would definitely have major implication for the security related affairs.

The organisational structure of the Indian Army is considered as a stumbling block for the force modernisation as the command structures have been reported as having low levels of co-ordinations. New combined military institutions have been recommended by many experts to overcome the problems of organisational structure and co-operation within the forces. The Chinese military modernisation has not been a smooth transfer from the traditional force structure to the new age theme. The military modernisation of the non-western states includes the restructuring of the military organisation and the introduction of new strategies. The western militaries have and are still undergoing these changes but the difference is that the western forces are far ahead in these changes. Far ahead in the sense that the less advanced states have to duplicate these measures of change to usher in the RMA in to their military domain.

In the case of the non-western states, the mass armies have to undergo size reduction and be technologically literate. The military structure fostered by both China and India are difficult structures. The most strategic need of the new age force is co-ordination during combat which is proving difficult within the forces as a cause of interservice rivalry. The Indian Air Forces and the Army has encountered difficulties in co-ordinating in joint operations while as individual forces, they are excellent. Such conceptual difficulties are known to hamper the development of RMA strategies in non-western states. A common occurrence of the twenty-first century is fostering regional co-operation between states in every sphere possible. The military sphere is very important in this co-operation. States have begun to participate in joint military exercises. This is a positive signal towards RMA as this includes the co-operation in military technology. These exercises are expected to improve the force co-ordinations. Joint operation within the state services has also been initiated to serve this purpose.

The western states also refer to RMA as force transformation. In the non-western states the commonly used term for RMA is force modernisation. It is a stark fact that a contemporary RMA is taking shape. There are debates on the viability of the RMA but the current military affairs prove otherwise. The possibility of RMA in non-western states is also considered to be debatable in the light of the obstacles in the non-western states. The RMA will need an overhaul of the existing military practices and weapons but a non-western RMA is very much possible in the coming years. Though a complete duplication of western RMA is not possible, a hybrid RMA with indigenous inputs can be achieved. The non-western states have already initiated

this purpose though stumbling blocks have been appearing. Technological knowledge gained from the western states has a main role in fostering the non-western RMA.

LIST OF REFERENCES

Alford, Jonathan (1981), *The Impact of New Military Technology*, London: International Institute for Strategic Studies.

Anand, A. (2000), *Information Technology: The Future Warfare Weapon*, New Delhi: Ocean books Private Ltd.

Anand, Vinod (2006), "Approach to Revolution in Military Affairs (RMA) and Information Warfare (IW): A Perspective", [Online: web] Accessed 24 June 2008, URL:http://www.usiofindia.org/article_oct_dec06_10.htm.

Anwer, S. M. (2002), "Managing Change in the Armed Forces", *Journal of United Service Institute of India*, 132 (548): 204-219.

Arqilla, John and David Ronfeldt (1997), *In Athena's Camp: Preparing for Conflict in the Information Age*, Washinton D.C.: Rand Publication.

Bajwa, J. S (2002), *Modernisation of the PLA: Gauging its Latent Future Potential*, New Delhi: Lancer Publications.

Bhat, Rajesh (2002), "Economic Power as a Concomitant of Military Power", *Journal of United Service Institute of India*, 132 (549): 372-382.

Biddle, Stephen (1998), "The Past as Prologue: Assessing Theories of Future War", *Security Studies*, 8 (1): 1-74.

Black, Jeremy (2005), *Introduction to Global Military History: 1775 to present day*, New York: Routledge.

Black, Jeremy (2006), "The Revolution in Military Affairs: The Historians Perspectives", *Journal of Military and Strategic Studies*, 9 (2): 1-49.

Blasko, Dennis J. (2001), "The RMA: China's Quiet Revolution", in Matthews Ron and John Treddenick (eds.) *Managing the Revolution in Military Affairs*, New York: Palgrave.

Cohen, Eliot A. (1996), "A Revolution in Warfare", *Foreign Affairs*, 75 (2): 37-54.

Cowan, Sam (1998), "The Management of Change in the Military", *Journal of United Service Institute of India*, 132 (548): 484-490.

Dikshit, Sandeep (2008), "Defence purchase policy revised", *The Hindu*, New Delhi, 10 August 2008.

Freedman, Lawrence (1998), "Revolution in Strategic Affairs", *Adelphi Papers*, 318 (16): 70-85.

Gahlaut, Seema (2002), "Emerging Trends in Multilateral Export Control Arrangements: Implications for India", *Journal of United Service Institute of India*, 132 (547): 53-61.

Goldstein, Avery (2005), *Rising to the Challenge*, California: Stanford University Press.

Hashim, Ahmed S. (1998), "The Revolution in Military Affairs Outside the West", *Journal of International Affairs*, 51 (2): 431-445.

Jayal, B. D. (2001), "Defence R&D and Defence Production", *Journal of United Service Institute of India*, 131 (546): 530-540.

Ji, Yon (1999), "Revolution in Military Affairs and evolution of China's Strategic link", *Contemporary Southeast Asia*, 21 (3): 345-364

Kelly, Jason (2006), "A Chinese Revolution in Military Affairs", [Online: web] Accessed 14 September, 2007, URL: http:// yale.edu/yjia/articles/vol.1_1ss_2 spring 2006/ Kelly 217.pdf.

Lal, A. K. (2001), "Exploitation of Space for Military Purposes: An Indian Experience", *Journal of United Service Institute of India*, 131 (546): 508-523.

------------ (2002), "Exploitation of Space for Military Purposes: An Indian Experience", *Journal of United Service Institute of India*, 132 (547): 62-67.

Libicki, Martin (1995), "What is Information Warfare?" [Online: web] Accessed 21 May 2008, URL:
http://stinet.dtic.mil/cgibin/GetTRDoc?AD=ADA367662&Location=U2&doc=GetTR Doc.pdf.

Mamik, Abjeet and C. Mani (1998), "Impact of Computerised War Gaming in the Army", *Journal of United Service Institute of India*, 128 (531): 72-85.

Mookerjee, S. (1997), "Indian Naval Doctrine and Force Structure", *Journal of United Service Institute of India*, 127 (527): 17-22.

Morgan, Patrick M. (2000), "Impact of the Revolution in Military Affairs", *International Strategic Studies*, 23 (1): 132-161.

Murray, Williamson (1997), "Thinking About Revolution in Military Affairs", *Joint Forces Quarterly*, 22 (16): 137-174.

Murthy, Padmaja (2000), "India and its Neighbours: The 1990's and Beyond", *Strategic Analysis*, 24 (8): 1411-1429.

Nambiar, Satish (1998), "India and the World Strategic Environment", *Journal of United Service Institute of India*, 128 (534): 575-586.

O'Hanlon, Michael (2000), *Technological Change and the Future of Warfare*, Washington D.C.: Brookings Institution Press.

Oberoi, Vijay (2003), "Air Power and Joint Operations: Doctrinal and Organisational Challenges", *Journal of United Service Institute of India*, 133 (551): 3-21.

Pillsbury, Michael (2000), *China Debates the Future Security Environment*, Washington D. C.: National University Press.

Pretorius, Joelien (2006), "The Revolution in Military Affairs in South African Defence Policy", *Strategic Review for South Africa*, 11 (1): 8-17.

Rastogi, S. C. (2003), "Indian Air Force and Technology", *Journal of United Service Institute of India*, 133 (552): 246-252.

Sahgal, Amrish (2003), "Non-Contact Warfare", *Journal of United Service Institute of India*, 13 (553): 434-443.

Saighal, Vinod (1997), "Restructuring of the Armed Forces", *Journal of United Service Institute of India*, 127 (529): 330-345.

-------------------- (1999), "Dealing With China in the Twenty First Century", *Journal of United Service Institute of India*, 129(535): 50-58.

Shambaugh, David (2002), *Modernizing China's Military: Progress, Problems and Prospects*, London: University of California Press.

Shambaugh, David and Richard H. Yang (1997), *China's Military Transition*, Oxford: Clarendon Press.

Shaw, Martin (2005), *The New Western Way of War*, Cambridge: Polity Press.

Singh, Jaswant (1999), *Defending India*, Bangalore: MacMillan.

Singh, Narender (1998), "Chinese Armed Forces", *Journal of United Service Institute of India*, 128 (534): 586-607.

Singh, V. K. (1998), "Integrating the Forces", *Journal of United Service Institute of India*, 128 (534): 654-663.

Sloan, Elinor C. (2002), *The Revolution in Military Affairs: Implications for Canada and NATO*, Montreal: McGill – Queen's Press.

Swaine, M. D. and A. J. Tellis (2000), *INTERPRETING China's Grand Strategy: Past, Present and Future*, Washington D.C.: Rand Publication.

Tilford, Earl H (1995), "The Revolution in Military Affairs: Prospects of Cautious", [Online: web] Accessed 14 September, 2007, URL: http: //www. Dtic.mil/doctrine/jel/research-Pubs/rmapros.pdf.

Toffler, A and Heidi Toffler (1994), *War and Antiwar*, New York: Warner.

Vadhyar, Rakesh (2003), "Managing Technology – A Challenge for the Future", *Journal of United Service Institute of India*, 133 (552): 233-245.