THE IMPACT OF BALLISTIC MISSILE DEFENCE ON NUCLEAR DETERRENCE

Dissertation submitted to Jawaharlal Nehru University in partial fulfillment of the requirements for the award of the degree of

MASTER OF PHILOSOPHY

PINKI ROY

International Politics Division
Centre for International Politics, Organization and Disarmament
School of International Studies
Jawaharlal Nehru University
New Delhi-110067

2012

Centre for International Politics, Organization and Disarmament

Date: 2. 1. 2013

DECLARATION

I declare that the dissertation entitled "**The Impact of Ballistic Missile Defence on Nuclear Deterrence**", submitted by me in partial fulfillment of the requirements for the award of 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.

Pinki Roy
PINKI ROY

CERTIFICATE

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

Prof. VARUN SAHNI
Chairperson, CIPOD

3/1/2013
Prof. RAJESH RAJAGOPALAN
Supervisor

Dedicated to my parents

Sathi Roy and Mahaprabhu Roy

ACKNOWLEDGEMENT

This acknowledgement is a tender of few words of appreciation and gratefulness to all those who have extended their support, suggestions and co-operation to me in all possible ways during the course of my research work.

It gives me immense pleasure to express my heart-felt gratitude and sincere thanks to my supervisor Prof. Rajesh Rajagopalan for his constant guidance throughout the work. His encouragement during the periods of difficulties and pragmatic approach to problems in the course of this investigation is worth remembering. His inspirational guidance and directions were extremely instrumental in improving the quality of my work.

I am indebted to the Centre for International Politics, Organization and Disarmament, SIS, JNU, for having evolved the research environment which culminated in me a sense of sincerity and hard work. I would also like to thank Prof. C.S.R. Murthy of International Organization, Assistant Prof. Siddharth Mallavarapu of International Politics, Associate Prof. Jayati Srivastava of International Politics and Assistant Prof. J. Madhan Mohan of Diplomacy and Disarmament at the Centre for International Politics, Organisation and Disarmament (CIPOD) who guided me throughout my M. Phil course work.

My sincere thanks to all the writers and authors whose work, I have referred in this dissertation and also to the Librarian and all the staffs of the JNU, New Delhi, for providing frequent assistance to me. I am highly indebted to a number of people for helping me during my research work. I am really obliged to my classmates for their help during the most urgent hours particularly Jharana and Sanchi . Last but not least, I would like to pay my sincere gratitude to my brothers Moloy Roy, Uttam Roy and Pinku Roy for being with me at each and every moment and bearing all that I have been going through.

PINKI ROY

CONTENTS

LIST OF ABBREVIATIONS

AAD - Advanced Air Defence

AAF - American Air Forces

ABM - Anti- Ballistic Missile Defence

AEW - Airborne Early Warning

AEGIS - Advanced Electronic Guided Interceptor System

AIPAC - American Israel Public Affairs Committee

ARPA - Advanced Research Projects Agency

ARGMA - Army Rocket and Guided Missile Agency

ASBM - Anti-Ship Ballistic Missile

ASM - Air to Surface Missile

ASROC - Anti-Submarine Rocket

ATM - Anti-Tactical Missile

ATBM - Anti-Tactical Ballistic Missile System

ATGW - Anti-Tank Guided Weapon

BMEWS - Ballistic Missile Early Warning System

BMD - Ballistic Missile Defence

BMDR - Ballistic Missile Defense Review

BMDO - Ballistic Missile Defense Organization

BTL - Bell Telephone Laboratories

C-1- Capability-1

C-2 - Capability-2

C2BMC - Command, Control, Battle Management and Communications Network

C-3 - Capability-3

CDI - Center for Defense Information

CIA - Central Intelligence Agency

DOD - Department of Defense

DRDO - Defense Research and Development Organization

DSP - Defense Support Program

EOR - Engage-on-Remote

GAO - General Accounting Office

GBI - Ground- based Interceptor

GBR - Ground-based Radar

GMD - Ground-Based Missile Defence

GMD - Ground-Based Midcourse

GPALS - Global Protection against Limited Strikes

HE - High Explosive

HQ - HongQi

HTPB - Hydroxyl-Terminated Polybutadien

ICBM - Intercontinental Ballistic Missile

INF - Intermediate-range Nuclear Forces

IOC - Initially Operational Capability

IAI - Israel Aircraft Industries Ltd

IR- Infrared Sensors

IRBM - Intermediate- range ballistic missile

JR - Junior

KM - Kilometer

LOADS - Low Altitude Defence System

MAD - Mutual Assured Destruction

MDA - Missile Defense Agency

MIRV- Multiple Re-entry Vehicles

MOU - Memorandum of Understanding

MRBM - Medium-range Ballistic Missile

NATO - North Atlantic Treaty Organization

NMD - National Missile Defence

NNK - Non-Nuclear Kill

NPR - Nuclear Posture Review

NPT - Nuclear Non-Proliferation Treaty

NRC - NATO-Russia Council

NTI - Nuclear Threat Initiative

OTA - Office of Technology Assessment

PAA - Phased Adaptive Approach

PAC - The PATRIOT Advanced Capability

PAD - Prithvi Air Defence

PTBT - Partial Test Ban Treaty

PAR - Perimeter Acquisition Radar

PATRIOT - Phased Array Tracking Radar Interceptor on Target

PDV - Prithvi Developed Version

PLA - People's Liberation Army

QDR - Quadrennial Defense Review

R&D - Research and Development Programme

RVs - Reentry Vehicles

SAB - Scientific Advisory Board

SALT - Strategic Arms Limitation Talks

SBIRS - Space-Based Infra-Red System

SBMs - Strategic Ballistic Missiles

SBX - Sea-Based X-Band Radar

SDIO - Strategic Defense Initiative Organisation

SDI - Strategic Defense Initiative

SLBM - Submarine-Launched Ballistic Missile

SM - Standard Missile

SRBM - Short- Range Ballistic Missile

START - Strategic Arms Reduction Treaty

TBMs - Theatre Ballistic Missiles

THAAD - Theatre High Altitude Area Defence

TLAM - Tomahawk Land Attack Missile

TMD - Theatre Missile Defence

UAV- Unmanned Aerial Vehicles

USAAF- U.S. Army Air Force

U.S.A - United States of America

U.S - United States

USSR - Union of Soviet Socialist Republics

VLS - Vertical Launching System

WCS - Weapons Control System

WMD - Weapons of Mass Destruction

XBR - X-Band Radar

CHAPTER 1

INTRODUCTION

> An inverse relation between faith in deterrence and interest in missile defence markedly reduce confidence in the reliability of deterrence has led to an increased appreciation of the need for National [ballistic] Missile defense in the post-Cold War period (Peoples 2010:189).

The technological revolutions and proliferation of ballistic missiles in recent decades have all ushered the beginning of a new wave of strategic concern which actually brought the development of Ballistic Missile Defence (BMD) into central focus as a reaction to such threat concerns. BMD though not a recent phenomenon, have become very controversial issue in recent times, with the U.S. decision of unilateral withdrawal from the Anti-Ballistic Missile (ABM) Treaty under George W. Bush regime. In fact, the varying nature of threats from state and non state actors along with the rise of new small powers either with nuclear and ballistic missile arsenals; or having a great enthusiasm to get its offensive protection are considered as primary reason for such U.S. move from established international order, which came after long and hectic round of negotiations. This departure has wider repercussions because of its nature to unbalance the global 'balance of power' based on the strategy of nuclear retaliation (Benjian 2001). In other words, since BMD reduces the efficacy of offensive forces for the post cold war era which tends to downplay the role of nuclear deterrence, this uneasiness enlarges the current debate of missile defence incompatibility with nuclear deterrence and its negative consequences for offensive-defensive arms race (Peoples 2010:1). This dissertation is an attempt to analyse the development of BMD across the globe ranging from its conceptual understanding of development, concerning the technologies used by different states in different period of times.

In particular, this introductory chapter would provide a brief background or information about missile defence and nuclear deterrence. It would identify the gaps and problems regarding the ensuing debates on the topic and will set out the puzzle which this research seeks to solve. It would also elaborate the methodology adopted and give a brief review of literature. In addition, this chapter also outlines the subsequent chapters.

Are nuclear deterrence and missile defence incompatible to each other? This question poses the most important puzzle for our research. Since the inception of the strategy of nuclear deterrence, missile defence has been viewed as destabilizing factor in the context of nuclear deterrence. In contrast to missile defence the concept of nuclear deterrence is often assumed as intertwined with the strategic offensive forces i.e. the threat of retaliation or the threat of punishment. Deterrence as most of the scholars claims is a policy of one state employed against other state to convince it in case of its belligerency. When this deterrence is secured by threat to use nuclear weapons, we call it nuclear deterrence. Since the deterrence depends upon the extent of threat, the weapon of ultimate destruction such as nuclear weapon poses highest level of threat. A credible deterrence requires that the deterring party has sufficient retaliation capabilities to impose high costs on its adversary and that the adversary perceives that the deterring party is willing to do so. As a result, retaliation becomes indispensible for the balance of deterrence relationship between two adversaries. Whereas missile defence, in contrast to the strategy of nuclear deterrence, often assumes "the efficacy of defensive forces [deterrence by denial] for the post cold war era (Peoples 2010:1)." Thus, because of this inverse relationship between deterrence and defence, proponents of nuclear deterrence oppose 'missile defences for their destabilizing offensive implications' and claim that simultaneous existence of nuclear deterrence and missile defence will be impossible (Lebovic 2002:462). As a result, the American withdrawal from 'the ABM treaty'[1] has led to significant controversy with regard to both the indeterminacy of deterrence and missile defence in the post Cold War era.

However, the erosion of the role of nuclear deterrence is not a new phenomenon as it can be traced back to year 1983 when the U.S 'President Ronald Reagan'[2] introduced strategic Defense Initiative (SDI) or Star Wars programme, significantly laid a road to the defensive development of missiles. This initiation saw a potential radical departure in the U.S. strategy on nuclear policy (Gray and Panye

[1] On 13 June 2002, the United States officially declared it's withdrawn from the ABM treaty (Karp 2006:63).

[2] In a land mark speech on March 23, 1983, President Ronald Reagan suggested that the policy of nuclear deterrence through the threat of strategic nuclear retaliation is inadequate; overemphasis on offensive forces is in itself destructive as the consequences of its failure would be intolerable for civilization (Gray and Payne 1984: 820)

1984:820). This move led a debate amongst scholars in terms of: What happened? Why did a revolutionary transformation occur in the strategy of nuclear deterrence? It is only because of the changing nature of threat perception etc. The literature in this regard reveals that the rise of 'Soviet Union's'[3] increasing missile threats during the Reagan administration, forced the U.S. diversion of preparing defence shield through missile defence system. Reagan policy was more radically followed by his successors particularly by George W. Bush and Barak Obama to ensure security at both domestic and international level by extension of BMD technologies to its allies.

"In effect, widespread deployment was given very serious consideration prior to the signing of the ABM Treaty in 1972 (Gansler 2010:1)." The historical evolution of the concept of BMD can be traced back with the developments of ballistic missiles. This idea was first mooted in 1944, when Germany first launched its disastrous V-2 ballistic missile against England. Thereafter, the sudden improvements in ballistic missiles both in quantity and quality during cold war rivalry of the U.S. and the U.S.S.R., posed serious global threat to every corner of the globe. In fact, the deployment of thousands of inter-continental ballistic missiles possessing the capability to inflict massive destruction to each other led the rival superpowers to enter into ABM Treaty of 1972, so as to control the strategic arms race between them (Youngs and Taylor 2003:9).

Although, BMD was used as a key element of strategic warfare between the two cold war superpowers: USA and U.S.S.R., "under the George W. Bush administration missile defence both as a programme and a concept underwent something of a renaissance (Peoples 2010: 181)." His decision to abrogate the ABM Treaty and to develop the Ground-based Missile Defence system, along with aggressively accelerating development of air based, sea based and space based systems ignited a new controversy with Russia and China (Gansler 2010:1). Russian anxieties have been exacerbated by the perception of growing U.S. unilateralism in security policy especially with regard to its extension of the BMD to Eastern Europe (Bowen 2001: 485, Peoples 2010:2).

[3] The terms 'Soviet Union', 'Russia', and the 'USSR' are used synonymously in this paper.

The recent ‘death of the ABM treaty’ in the post-Cold War era has led to many questions regarding traditional understanding of strategic security policy (Karp 2006:63). For example, is Cold-War nuclear deterrence strategy still an important element for post Cold-War security stability? Or does the present system require defensive security arrangement to sustain international order? If so, is BMD providing an adequate deterrence? The development of early twenty-first century, especially the increased overall impacts of proliferation of ballistic missiles has reversed the situation of strategic environment and gave rise to the resurgence of security oriented environment. The desire for certain states and non- state actors to increase their security status through the acquisition of missiles call into question the logic of nuclear deterrence as an instrument to ensure security. The most relevant example of the failure of nuclear deterrence toady is the event of 11 September, 2001 terrorist attack on the United States where “notwithstanding the immense retaliatory capabilities of the Unites States, an adversary was willing to attack and face the consequences (Smith 2006:3).” It forced the Bush administration to develop an effective national ABM system (Peoples 2010:183). Bush’s decision to develop National Missile Defence (NMD) was supported by many pro missile defence enthusiasts. Indeed, they claim that missile defence with deterrence is clearly a complementary response to the new threat and that defences may even more effectively negate the potential of adversaries and would absolutely render an attack not only fatal, but futile (Lebovic 2002: 456).

On question - can missile defence truly exercise the credibility of deterrence? There exists disagreement amongst scholars and security experts with regard to the role of ballistic missile as deterrence. On one hand, whereas missile defence plays an important role against the nuclear deterrence of ‘rouge countries’[4] as well as terrorist activities; at the same time, on the other hand, the unilateral development of missile defence by one country destabilizes the logic of existing balanced order based on deterrence (Futter 2011b:254). In the short term, the development of missile defences in unstable regions around the globe can have a positive impact on ensuring security; whereas it is likely to be a far more destabilizing act as it leads to competition with regards to priorities over nuclear deterrence (Futter 2011b:258). Here the opposite

[4] In general rough states are grouping of worrisome states (Smith 2006:3). For further detail see defining term of rough country on chapter 3, p.63

inter-relationship between missile defence and nuclear deterrence again makes missile defence and nuclear deterrence incompatible.

The problem, however, is that if ABM were developed by some major powers that face the wrath of new techno friendly dangerous non state groups or rouge states, which in turn present a problem for the credibility of nuclear deterrence exercised by the small nuclear deterrence powers. In other words, this dichotomy may or may not lead to the stability. Based on this dichotomy, this section formulates hypotheses to be analysed in next three chapters and tested in concluding last chapter. These hypotheses are:

(1) The first hypothesis argues that such development will change the deterrence relationship with stable nuclear powers; and the effect of BMD is primarily destabilizing the deterrence policy as it operates in dramatically different situations those are often complex, multisided and largely asymmetrical.

(2) The second hypothesis argues that we need compatibility between missile defence and nuclear deterrence for future strategic stability.

(3) The third hypothesis argues that there exists a strong dialectic relationship between the logic of nuclear deterrence and missile defence.

This study looks at the development of BMD in order to explore the relationship between missile defence and nuclear deterrence and investigates how they are interrelated under certain circumstances. In particular, this study would focus on the concept of incompatibility of missile defence and deterrence, because much of the debate about missile defence ignores this vital issue. How the relationship between missile defence and nuclear deterrence creates incompatibility for each other is also essentially important to secure the global security threats as well. Another problem with existing literature lies in their inability to explain the rapid development of ballistic missiles in the past few years. This study would attempt to fulfill this gap of literature. Since nuclear deterrence and BMD are correlated issues and inter-dependent on each other, 'neither one alone can offer sufficient basis for strategic stability'; so this study would try to find some ways to make them compatible (Karp 2006: 63). While doing so, the research focuses on the impact of BMD on nuclear deterrence equations as well as its nexus with the emerged security dilemma. The concepts like ballistic missile proliferation, arms race would be re-analysed to reopen the debate between deterrence and defence.

This study has left aside country specific discussion and largely focuses on the aspects of BMD and nuclear deterrence. It investigates and examines the impact of BMD for nuclear deterrence from the point of deterrence by denial. Though in chapter 3, some countries like the USA, Russia, China, India and Israel have been selected for understanding their BMD and technical aspects thereof, the major emphasis of this research lies in the stability-instability paradox emerging out of the intrinsic relationship between BMD and nuclear deterrence. In other words, it would try to explore whether BMD enhances the stability of deterrence, or, whether it is destabilizing the deterrence stability. In doing so, a re-examination of the concept of deterrence in light of current trends including missile proliferation, increasing BMD and terrorism would be conducted.

The basic objectives of this study are of three folds:

Firstly it has attempted to provide different policies and programmes in the evolution of BMD system. One reason for this assessment is to find out the difference between the Cold War strategy of BMD and post-Cold War strategy of BMD. In this context, it would analyse the U.S. President Nixon decision to develop Safeguard missile programme and President George W. Bush's decision to develop 'National Missile Defence (NMD)'[5] programme.

The second objective is to analyse the changing nature of deterrence in the post Cold War period. Since this term has been changed considerably over the years with the advent of ballistic missile; it is important to determine how the concept of deterrence has changed and what it means today. In this context, this study analyses two important programmes first programme launched by President Ronald Reagan termed as Strategic Defense Initiative (SDI) programme, and second launched by President George W. Bush's termed as new strategic framework, articulated in the form of a new strategic triad, consisting of both nuclear weapons as well as non-

[5] National missile defense is the policy to deploy technologically possible an effective [territorial] missile defense system capable of defending the whole territory of the States against limited ballistic missile attack whether accidental, unauthorized, or deliberate (Bertucchi 2001:1).

nuclear precision-strike capabilities with a revitalised nuclear infrastructure (Wirtz 2006:87).

The third objective is, instead of simply trying to delineate missile defence as a factor affecting nuclear deterrence, attempts to find out their compatibilities in the new strategic environment. In this context, this study highlights the role of missile defence in contemplating deterrence in the 21st century from two different perspectives: firstly as missile defence in strengthening the credibility of traditional deterrence and secondly as missile defence in strengthening regional deterrence.

The investigation about the compatibility and incompatibility of deterrence and defence in the current operating environment requires an in-depth exploration of academic materials and literature review thereof, which helps us to have a general and broad understanding about the close relationship between missile defence and nuclear deterrence. While a number of books, journal articles, and newspaper articles have been published since the advocacy of ballistic missile in 1944, a few scholars such as Kenneth Neal Waltz and Scott D. Sagan, Rajesh Rajagopalan, Aaron Karp, Peoples Columba, Nik Hynek and Andrew Futter have been engaged at best with the concept of deterrence and missile defence. Aaron Karp in his article *The new indeterminacy of deterrence and missile defence* published in 2006 brings out a recent debate about the incompatibility and compatibility of missile defence with deterrence. Throughout this article, he tries to find out the relationship between deterrence and defence on one hand and indeterminacy of deterrence and defence on the other. In doing so, he has analysed several factors those were responsible for the mutual transformation of deterrence and defence.

Andrew Futter, in his article *Getting the Balance Right: U.S. Ballistic Missile Defence and Nuclear Non-proliferation* published in 2011 has discussed in detail about the role of BMD in strengthening nuclear deterrence and future global security agenda such as nuclear non-proliferation policy. In this article, he strongly appreciates President Obama's perception of the deterrent value of missile defence and the subsequent development of comprehensive missile defence decisions in and around the globe. Peoples Columba published two years ago, a more renowned book entitled Justifying *Ballistic Missile Defence: Technology, Security and Culture* (2010), which is very crucial in developing a foundational understanding of BMD history and the importance of that history on the contemporary global security agenda. Though this book does not focus on nuclear deterrence, it presents several helpful insights in describing a changing nature of security environment and its relationship with ballistic missile technology.

Kenneth Neal Waltz and Scott D. Sagan's most well known authority in international relations, in their book *The Spread of Nuclear Weapons: A Debate Renewed* published in 2003 has proposed a renewed debate on proliferation of nuclear weapons. In this book, Waltz who belongs to the proliferation optimist school, argues that gradual spread of nuclear weapons is better rather than no spread, as it increases deterrence and defensive capabilities which in turn makes war hard to start. The proliferation of nuclear weapons by states does not matter for Waltz, because he asserts that such proliferation will not necessarily destabilize the international order rather will increase the probable cost of conflict. Since the consequential threat of nuclear attack will be very high, it will deter the leaders from engaging in war against nuclear-armed states and thereby such proliferation will creates conditions for a more peaceful world. Thus, for Waltz nuclear weapons are primarily a tool of deterrence and their existence is a stabilizing factor in international politics. He also says that the proliferation of nuclear weapons by more states would actually lead to greater stability at systemic and sub systemic level. Contrary to Waltz, Sagan who belongs to the pessimist school of thought asserts that such an optimistic view of nuclear weapons is dangerous for the world (Goswami 2006). The argument made by Sagan is that differences in the technological conditions, political and organizational behavior of the states are likely to lead deterrence failure and deliberate or accidental war. The U.S. is recently, very much concerned about the probable fall of nuclear weapons in hand of the militants. This threat is aggravated in May 2011 when militants attacked on a military installation in Karachi claimed to have nuclear arsenals (Kerr and Nikitin 2012:18).

Rajesh Rajagopalan in his article *Missile Defences in South Asia: Much Ado about Nothing* published in 2004 has discussed about BMD systems and the impact of such missile defences on strategic stability in South East Asia. While doing this he analyses American BMD programmes in order to find out how it affect strategic stability in South Asia. In his comparative analysis of BMD programmes of India, China, Pakistan and American, he focused on intrinsic relationship of BMD impact on deterrence capabilities. The main purpose of his article is to find out the destabilizing effect of defensive BMD systems. In another article entitled *Missile Defence Discourses and Practices in Relevant Modalities of 21st-Century Deterrence* published in 2010, Nik Hynek investigates the complex relationship between missile defence and nuclear deterrence. While understanding of this general relationship, he focuses on the renewed current relations between the U.S. and Russia. He critically examines the political arguments concerning the need to abandon or overshadow nuclear deterrence in the context of plans to build the missile defence system (Hynek 2010:436). According to the author's main argument, the departure of missile defence from deterrence makes no sense, as while the purpose of missile defence is to renew the strategic deterrence between the USA and Russia; and thereby strengthening it through reverse deterrence of the U.S against rouge states (Hynek 2010:435). The conclusion made by the author is that missile defence is closely intertwined with deterrence of the 21st century (Hynek 2010:435).

The methodology of this study would primarily be a deductive analysis of the relationship between missile defence and nuclear deterrence. Missile defence would be taken as an independent variable and then the impact of this independent variable over dependent variables like nuclear deterrence and overall impact upon the global security strategy would be investigated. Broadly speaking, the methodology of this study depends upon the contents and purpose of each chapter and accordingly comparative methodology is also used.

The proposed study would employ mostly secondary sources like books, articles from journals and magazines and newspapers- both national and international. The sources for the study material will mostly be taken from libraries in and around Delhi. Internet will also be used to keep the research updated based on the latest developments.

The next chapter will provide necessary background information on BMD systems and their technologies. The main task of this chapter is to analyse BMD in conceptual terms. In doing so, it would discuss the history of missile development and various policies and programmes that are associated with the development of BMD. In this context, it would attempt to explain the following six policies in the history of BMD development: the General Electric Company's Project Thumper, the American Air Forces (AAF) project WIZARD, the U.S. Army's NIKE- ZEUS and NIKE-X project, the U.S. President Johnson's policy to develop Sentinel ABM system and the President Nixon's policy to develop Safeguard ABM system. While doing this, it would try to assess the extent to which the spread of nuclear weapons and ballistic missile technology influence the rise of missile defences. Here, an effort will also be made to trace the debates surrounding BMD based on ABM Treaty of 1972. The chapter will also follow the discussion of BMD under the President Ronald Reagan and President George W. Bush. One reason for this assessment is to find out what kind of strategic thought led to the BMD developments, essentially at two different periods of time. For this purpose, it would analyse President Ronald Reagan's decision to promote SDI programme and President George W. Bush's decisions to withdraw from the 1972 ABM treaty. Essentially, this chapter explains how the missile defence has re- emerged in the post-Cold War era and why Bush administration had taken such a revolutionary step against ABM treaty. This chapter will also explain the technological development of BMD in the post Cold War era.

With reference to more recent technological developments for missile defence, chapter 3 would analyse the extension of BMD systems of various countries. This analysis incorporates discussion of BMD system of the U.S., Russia, China as well as India and Israel. The main focus is on analysing the technological configurations of various BMD systems and possible differences among them. It will also explain the major BMD systems and their sub contents. In this context, the major discussion will revolve around : (1) BMD systems of the U.S. including its Ground- Based Mid Course Defence (GMD), multilayered BMD consisting of Phased Array Tracking Radar Interceptor on Target (PATRIOT); Advanced Electronic Guided Interceptor system (AEGIS) and Theatre High Altitude Area Defence (THAAD) Systems; Russian BMD systems comprising the ABM-1 to ABM-2, and ABM-2 to ABM-3; Chinese ABM systems including FanJi 1, FanJi 2 and FanJi 3; Indian BMD systems including Prithvi Air Defence (PAD) and Advance air defence (AAD) and finally will discuss Israeli Arrow missile and Iron dome missile defences.

Chapter 4 would look at BMD and nuclear deterrence. The purpose of this chapter is to evaluate the causal relationship between nuclear deterrence and BMD. In doing so it would attempt to conceptualize both concepts of deterrence: deterrence by retaliation (deterrence by punishment) and deterrence by denial. How BMD as a strategy of deterrence by denial affects the retaliatory deterrence is the main concept of this chapter. Essentially, this chapter analyses three different areas where BMD have had a profound impacts on nuclear deterrence: in the traditional relationship between the U.S. and Russia, in the ABM Treaty and finally in destabilizing deterrence stability with small nuclear states. The chapter also analyses the changing nature of strategic environment in the post Cold War era and assesses the factors that are responsible for the transformation of nuclear deterrence into defensive deterrence. This chapter also highlights the important role of BMD in complementing deterrence in the 21st century. In doing so, it assesses the contribution of BMD in two different areas where it may offer additional layer to deterrence namely - (i) missile defence in strengthening regional deterrence, (ii) missile defence in providing shield against destructive first attack launched by an adversary enemy. This chapter also discuss the recent development of comprehensive missile defence under the Obama administration particularly focusing on President Obama's decisions to develop a new missile defence policy called the Phased Adaptive Approach (PAA) in Europe.

Chapter 5 finally deals with conclusion and summarises the argument of all the preceding three chapters in order to evaluate whether the research aims or objectives are achieved and whether the proposed hypotheses are proved or rejected. This chapter will also discuss the implications that missile defence holds for further security strategy.

CHAPTER 2

CONCEPTUAL DEVELOPMENT OF BALLISTIC MISSILE DEFENCE

> Procuring defenses is like buying "insurance" that would limit the consequences of war; the outcome would still be a disaster, but probably one of a very different order than would result from having the same offensive forces expended in a war with no missile defense (Brennan 1969:434-435).

2.1 INTRODUCTION

The rising asymmetric balance between offence and defence, where there is little chance for counterattack, the innovation in defence mechanism is imperative. One such innovative mechanism where consideration of nuclear missiles proliferation comes to the fore in relation to security is Ballistic Missile Defence (BMD) [Peoples 2010:1]. On the one hand, missile defence represents itself as a ‘shield against nuclear missiles’; on the other hand, it acts like a fuel in missile proliferation (Peoples 2010:2). This catastrophic and paradoxical effect has been successfully demonstrated by powerful States after German ballistic missile attack against England during Second World War. With the advent of Cold War, this offence-defence strategy gradually brought countries to the verge of third World War on several occasions. Amid several crises and ‘after decades of diplomatic wrangling,’ a breakthrough was achieved on May 26, 1972, when the U.S. President Richard Nixon and the Secretary of former Soviet Union, Leonid Brezhnev signed a treaty, popularly known as the ‘Anti-Ballistic Missile (ABM) Treaty’ which aimed to reduce the intensity of the missile arms race (Frye 1996:96). However, the recent departure of the U.S. from the ABM treaty during President George W. Bush regime gave a setback to several policy makers’ efforts of reaching to some normative consensuses under ABM, after several rounds of previous negotiations on missile development. The U.S. departure saw the beginning of a new era in BMD history.

However, this current reincarnation of BMD was the result of cumulative defensive process rooted in early 1950s ABM programmes. The early foundations of 1950’s were continuously redirected and reprocessed by the successive Presidents of the U.S., be it President Ronald Reagan’s Strategic Defense Initiative (SDI) or Soviet efforts in missile defences. The way, these programmes were fuelling strategic environment, eventually led to ‘great debates’ over security (Peoples 2010:4). In terms of the evolution of BMD, these great debates have, therefore, critical importance.

While the first debate over missile defence largely remained confined to policies evolved with developmental programmes; the second phase of debate "has enlarged a considerable amount of discourse over the intentions behind missile system and its potential impact on the nuclear arsenals and global security (Peoples 2010:1)." Undoubtedly, the issue triggered a widespread debate as regard to whether such a system could be built or not. While the question about the development of BMD has formed one part of the missile defence issue, the question of whether such a system would be technologically and economically feasible formed the other part of concern. However, the recent withdrawal from the ABM Treaty by President George W. Bush brings us at the threshold of a new debate concerning the deployment of BMD. While Bush recognized the need to develop missile defence, "many of his opponents felt that it would lead to a destabilizing spiral of arms racing (Sessions 2008:28)." As a result, the decades old debate over ballistic missile defence has entered into a new phase encompassing several complicated issues.

While, drawing attention on both these debates, the purpose of this study is not to make a reassessment on missile debate but try to find out what kind of strategic thought led to the BMD development essentially at two different periods of time. For the sake of convenience, this chapter is divided into three sections.

The first section would focus on the technical aspects of BMD system and also on their components by which the system operates. The main purpose of this section is to analyse the functions which this system is required to perform in order to overcome the offensive might. An attempt would also be made to identify the problem which the system might face to prevent missile attack once it has been launched for targeting particular area. Finally, it would also discuss the critical countermeasures that attacker may take to disrupt the function of defence system.

The second section would analyse the historical background of BMD development. In doing this it would take into consideration various policies and programmes associated with the development of BMD and then an attempt would be made to show how it evolved through different phases. An effort will also be made to trace the debates surrounding ABM during 1960s so as to assess the extent to which several missile development projects received public resistance that ultimately made the 1972 ABM treaty a reality. The analysis also incorporates discussion of SDI, as well as other initiatives relevant to the analysis of ballistic missile defence programme.

Lastly, this chapter will focus on new strategies and technologies that have shaped the contemporary missile defence. It would do so, by assessing the extent to which the spread of nuclear weapons and ballistic missile technology influenced the rise of missile defence, and how it shaped the public discourse over missile defence strategies. The chapter will also follow the discussion of BMD under the George W. Bush administration and examine the impact of his revolutionary step to move away from the 1972 ABM Treaty.

However, this chapter will not focus on the details of the discourse over missile defence; instead it will try to understand those circumstances that made BMD indispensible, in spite of the continuous wider public resistance across the world.

2.2 BACKGROUND

In terms of analysing the development of BMD and its related defensive policies and programmes, one has first need to assess the historical attempts in this direction. As Peoples (2010:77) argues missile defense constitutes a classic case of the search for a technological solution to a security problem. Although, the idea to construct BMD began in 1944, the actual programmes and policies that made BMD a reality started in post 1950's. The fact that the BMD as an idea emerged not only with the German revolutionary attack against England but also with the continuous research and deliberations of a body of eminent scientists, who sought to improve the existing defence system via a cumulative defensive program (Basu 2006:3). In this context, the American armed forces played key role as they directed and managed most of the defence policies and programmes. While the army was assigned with the responsibility of developing Project NIKE, the Air Force was entrusted with responsibility for developing Project WIZARD.

By the year 1960, a significant scientific controversy over BMD has emerged. This in turn led to wider public discourse but amid these controversies, the U.S. President Nixon's decision to proceed towards developing a new ABM system known as 'Safeguard' fueled the discourse and forced the other countries to redesign their offence-defence strategies. In such an overheated and tensed political and security environment, the U.S. President Richard Nixon and the Secretary of former Soviet Union, Leonid Brezhnev signed the ABM Treaty in 1972 to prevent the nationwide development of missile defence system by either superpower. Simultaneously with this treaty, both countries also signed an agreement known as Interim Protocol to limit strategic arms race. Although, ABM Treaty of 1972 prohibits missile development but its provisions does not impose any restriction on ABM research and development programmes. This is one of the reasons which made the ABM Treaty attractive but inefficacious.

However, a major development on BMD occurred in 1983, when President Ronald Reagan initiated SDI research programme. Addressing to the American citizens, from a national television he declared that:

> I am directing a comprehensive and intensive effort to define a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles (Raffier 1996:23).

Unfortunately, the U.S. enthusiasm of developing an effective missile defence system was further propelled by the Iraq when it launched SCUD missile against the U.S. military troops in the 1991 Gulf War. Since then, more advance system have been developed and tested to make BMD technologically more credible and viable. The event of 9/11, 2001 brought the world at the threshold of a new debate on potential impact of BMD for security. It strongly reinforces the need to prepare BMD to counter asymmetric offensive threats. As Peoples (2010:1) observes in this context that missile defence attracted consistent support, ostensibly justified by concerns over ballistic missile and proliferation of nuclear weapons and their prospective use in terror attacks, cyber-terrorism and so on. A careful assessment here makes it clear that current positions on missile defence retain much of their old rigidity (Karp 2006:65). Yet, there is widespread disagreement as regard to whether such a system could be built or not. Moreover the U.S. recent withdrawal from the 1972 ABM Treaty under

President George W. Bush has caused to reflect a great deal on the subject of missile defence.

2.3. TECHNOLOGICAL ASPECTS OF BALLISTIC MISSILE DEFENCE

A credible understanding of BMD requires the examination of the concept such as BMD, its components, functions, phases of trajectories and probable countermeasures which are analytically described below in nutshell, under following heads:

2.3.1 WHAT IS BALLISTIC MISSILE DEFENCE?

Since its inception, BMD have been described by many as an interceptor to destroy enemy missile attack. BMD as described by the BMD research programme is an interceptor missile to shoot down enemy missiles after they have been detected or tracked by some kind of radars (Scheneider 1969:1). These systems would be able to protect a target area from the enemy attack by intercepting ballistic Reentry Vehicles (RVs) of the incoming missile, sometimes even before their re-entry into the earth's atmosphere. Since the BMD is designed to deal with different kinds of threats, the composition of BMD varies according to the nature of threat. It has, therefore, different levels, many shapes and sizes (Rance 2001:36). Accordingly, ballistic missiles can be categories on the basis of their ranges as described below:

Short-Range Ballistic Missile (SRBM): up to 800 Kilometer (s) [km]; Medium-Range Ballistic missile (MRBM): range between 800 km to 2400 km; Intermediate-Range Ballistic missile (IRBM) or Long-Range Ballistic Missile (IRBM) having ranges of 2400 km to 5500 km; Intercontinental Ballistic Missile (ICBM) having ranges in between 5500 km to 15600km (Rance 2001:36).

Some scholars and war strategists' also classified ballistic missiles under category of Theatre Ballistic Missiles (TBMs); Strategic Ballistic Missile (SBM). The TBM have a range less than 3500 km and can be further categorised into short, medium and long ranges. The German V-2 ballistic missile and Iraq's SCUD missile were the examples of TBM. SBMs are particularly designed to attack neighbouring states. Missiles used to protect the target area against these missile attacks are called

‘ABM’[6]. It was hoped that such system would be able to destroy the offensive might and provide a shield against destructive missile armed with nuclear weapons (Youngs and Taylor 2003:9).

2.3.2 COMPONENTS OF BALLISTIC MISSILE DEFENCE SYSTEM

The BMD system is the composition of many elements. Each of these elements acting in different directions is together referred as complete BMD system. Such system contains:

(a) Different types of radars including sea-based, ground based and space-based radars which together called network sensors.

(b) Missile interceptor armed with nuclear warheads is able to operate both within atmosphere and outside atmosphere (Weiner 1984: 49). Missile interceptors consist of: (i) the hit to kill technology relying on the force of a direct collision with the incoming missile; (ii) multiple warheads. The example of this type of interceptor is the submarine-launched (SLBM) Polaris A-3, which carries three warheads (Flax 1985:44).

(c) An operational system called C2BMC (command, control, battle management and communications network) acting as a link pin between the sensors and missile interceptors and,

(d) Area defence systems using infrared sensors (IR) and terminal defence systems accomplished with command, control, battle management and communications network (Weiner 1984:49).

2.3.3 FUNCTIONS OF BALLISTIC MISSILE DEFENCE SYSTEM

Any BMD system, designed to deal with whatever kind of threats, must perform certain functions. The major functions of BMD are:

Target observation: When a ballistic missile is launched to target particular area, it is first function of the defender to find out that target as soon as possible (Rance 2001:27). The most effective way to track the target is to use radar, because

[6] Anti-ballistic missile (ABM) and Ballistic Missile Defence (BMD) are used synonymously in this paper.

radar would quickly locate the incoming missile from a long distance. However, the effectiveness of radar is not possible to measures. As Herzfeld (2008:119) observes that a modern radar system can acquire the kind of targets with which we are concerned at a distance of several thousand miles but that does not mean that the defence can tell exactly what is coming at it, only that something is coming.

Prediction: Once the radar has detected the target, it is important to track the target missile where it is going, such prediction is necessary to determine the target impact point and to select the potential interceptor points (Weiner1984:59).

Discrimination: It is the process to distinguish real warheads that should be intercepted from nonlethal booster fragmented warheads or decoys (Weiner 1984:59). This is the most important function performed by BMD system. If BMD system fails to make a proper discrimination between reentry vehicles carrying nuclear warheads from decoys, the whole BMD system will fail to protect a target system. This is, of course, one of the crucial functions which make the feasibility of BMD technologically uncertain.

Interception: After making discrimination, the interceptor of BMD system must be able to reach the target point, at the right time and for the rendezvous with the warheads (Rance 2001:37). The effectiveness of this function depends upon the collision force of interceptor with the incoming missile. It has rightly been observed by Herzfeld (2008:120) that the defense needs the hottest kind of interceptor with a very fast response time and a very large thrust, to cover the distances required in a very few seconds.

Command, control, and communication system: Since, the BMD system has different types of sensors which may be located in different places, "There is a strong desire for a very complex, secure, and reliable command, control, and communication system for co-ordinating decision making process amongst these sensors (Gansler 2010: 28)." "This system has to be largely an automatic process, but most experts assert that, somewhere, there has to be a human in the loop (Rance 2001: 37)."

Kill assessment: This is the final stage for defence system to kill the targeting objects. The system is designed to destroy the incoming warheads by hitting or shooting down reentry vehicles. This system is accomplished by a nuclear warhead and newly employed Nonnuclear Kill (NNK) mechanism known as 'hit to kill' interceptor (Weiner 1984: 63).

2.3.4 PHASES OF BALLISTIC MISSILE DEFENCE TRAJECTORY

When an interceptor has been launched for completing the mission it goes through different phases of flight called as the boost phase, the midcourse phase and the terminal phase. It offers another way in which BMD system can be classified as a boost-phase, midcourse and terminal defence system.

Boost Phase Defence Trajectory: The boost phase defence has significance importance in BMD mission. Even according to some experts, it is the most effective way to counter the enemy's missile in flight and to kill it, in its initial phase before they begin to release their warheads. The flight of a ballistic missile during this stage lasts from 300 to 500 seconds for ICBMs and 200 to 300 seconds for Submarine-Launched Ballistic Missiles (SLBMs). Accordingly, a boost-phase BMD is located near the launch site to intercept the target of attacker. Boost-phase missile interception systems consist of three components: a sensor to track target, Kinetic-Kill Vehicles (KKVs) to destroy ballistic missile targets and a missile interceptor to launch these KKVs (Wilkening 2004: 2). In addition, it uses the Airborne Laser (ABL) - the world's first high-energy laser weapon (chemical oxygen-iodine laser) mounted on an airborne platform (Kumar 2008a: 174). The Airborne Laser would provide the boost-phase missile the ability to engage tactical ballistic missiles as early as possible even while they are still over the enemy's territory (Benson 1997: 389). Since in boost phase, a missile is highly vulnerable to destroy as it is large and soft and moves relatively slowly, it would easily be tracked by a BMD system (Gansler 2010:11).

> A major advantage in this kind of system is that the fighting would be conducted near or over the enemy's territory, and for that one would be able to concentrate the damage 'there' rather than here (Herzfeld 2008: 120).

Yet there has been considerable controversy, over the technical feasibility of boost phase defence. Many opponents argued that the effectiveness of tracking the incoming missiles in its boost phase could be reduced by shortening the time duration of launched offensive missile (Bethe et al.1985:56). In other words, since the missile takes its speed in its boost phase to get its optimal speed, BMD systems find it as most effective phase to track and encounter it, however once it get its optimal speed it become difficult for BMD systems to track the missile and hence its effectiveness reduces significantly. Thus if enemy country makes improvement in its missile trajectory during boost phase in such a way, that it significantly reduces the time taking of missile to get its optimal speed; the missile is enabled to release its countermeasures i.e. the penetration aids and decoys, outside the earth's atmosphere, where many BMD weapons are ineffective to destroy these dummy warheads (Bethe et al.1985:56).

Midcourse Defence Trajectory: Once the warheads have been released, they travel through the midcourse phase, for approximately 20 to 25 minutes for an ICBM and 5 to 20 minutes for an SLBM, in which it allows for long period to build a number of defensive measures capable of intercepting sophisticated warheads and decoys (Adams, 1971:4, Bethe et al. 1985:57). Presently, the U.S. Advanced Electronic Guided Interceptor System (AEGIS) BMD is the only operational mid-course interception system (Kumar 2008a:174). However, in this phase, making discrimination of RVs carrying nuclear weapons from other objects such as decoys is become technologically challengeable. This is, of course, one of the reasons, which makes the capability of midcourse BMD system either vulnerable or ineffective.

Terminal Defence Trajectory: The final phase in the ballistic missile trajectory is the terminal phase, in which a defence could possibly operate against the enemy RVs during its last stage of flight. Since the terminal defence phase has a very short duration for interception as it is lasting only up to 2 to 3 minutes, it requires high accelerated interceptor missiles to get find out RVs as quickly as possible. One major disadvantage in the terminal BMD system as observed by Herzfeld (2008:121) is that in the terminal defence all the fighting goes on over one’s own territory and that one has, so to say, no second chance, if one has made a mistake.

2.3.5 COUNTERMEASURES

Man has inherited the nature of domination and resistance from the very beginning of human civilizations and since this domination and resistance phobia has a direct correlation with accelerated or diminished capability of offence-defence weapons, we find as said by Zeijden that there is a continuous race between swords (offensive) and shield (defensive) since men learned to wage war (Zeijden 2007:2). In other words, the more improvements one make to the shield, the more improvements are made to the sword as well (Zeijden 2007:2).

Much of the public discourse, over BMD system, has centered on the promise held out by offensive means, used in penetrating defences, especially the so-called countermeasure tactics. These techniques include various types of decoys, the use of balloons, cones, dispensing chaff, penetration aides (darts and jacks) and salvage fusing, Multiple Re-entry Vehicles (MIRV), and maneuverable warheads (Adams 1971:8, Coffey 1967:403). Each of these countermeasures increases the complicity of the defensive task of BMD system. As Rance (2001:40) observes, it is impossible to guess every aspect of the offence plan, after all, this is not a game with rules. Even to some experts, "these types of defense suppression tactics could pose greater threat to a space-based BMD system (Bethe et al. 1985: 66-77)."

The game of countermeasures and counter-countermeasures goes on in every aspect of ballistic missile operations, as it like any other weapon development (Gansler 2010:34). Any country which develops BMD system could also develop some kind of countermeasures to intercept enemy missiles from penetrating defence. This is the logic behind the current strategy of developing a multilayered BMD system which would be able to intercept a missile in all the phases of flight (Gansler 2010:34). Analyzing this paradoxical situation, the Director of the U.S Ballistic Missile Defense Organization observes:

> Credible, sophisticated countermeasures are costly and difficult to develop and make effective whereas simple, cheap attempts can be readily countered, given our extensive toolbox and the 40 years of experience with offensive and defensive weapons systems, we know how to play the game of countermeasures and counter-countermeasures. And we know how to win (Rance 2001:40).

2.4. A BRIEF HISTORY OF BMD

It is well said that every innovation has an unending chain of evolution. Evolution in one stage paves the way for next stage of evolution. The idea of BMD was mooted in the year 1944, when Germany first launched a V-2 (A-4) ballistic missile attack against England. It was the world's first operational ballistic missile developed by Germany under supervision of its two leading prominent scientists - Wernher von Braun and Walter Durenberger. The significance and potential threat of these missiles was immediately realized by some visionaries within the American Army Air Forces, and before the close of World War II, they began the formulation of a postwar long term guided missile development programme (Rosenberg 1960:1). To materialize their vision, in 1944 a group of the U.S. Army Air Force (USAAF) officers with the help of General Electric Company engaged in an extensive research and development programme to find out the possible defence mechanism to counter the V-2 missile. After a few months, the General Electric Company observed "the adequate defense against the V-2 was to prevent the launching of the rocket by destroying or capturing the launch site (Adams 1971: 17)." On the basis of this observation report, two projects were sanctioned to study the technical and scientific aspects of missile development. One was 'Project Thumper' which focused on development of anti-craft missile defence programme while the other one named 'Project Hermes' focused on the development of surface-to-surface missile programme. Within a year, the General Electric Company's Project Thumper report concluded that, "defense was beyond the scope of contemporary technology (Adams 1971: 17)." However, this pessimistic conclusion about the possibility of defence did not deter the scientific community to develop a ballistic missile defence against enemy missiles (Papp 1987-88).

The next significant step in missile defence development was the 'Project Nike' which was a joint project launched by the Bell Telephone Laboratories (BTL) and Western Electric Company in 1945. This project successfully launched the 'NIKE-AJAX' ballistic missile to intercept bomber planes. However, it was soon fitted with a nuclear warhead and with improved targeting systems elevated as 'NIKE-HERCULE' (Goddard 2007: 5).

Throughout the period of these studies, we see a continuing contest for the missile defence mission between the U.S. Army Forces and Air Forces, which ultimately led to the separation of the U.S. Air forces from the U.S. Armed forces. As a consequence, two major missile projects emerged, one initiated by the Navy and the other by Air Force (Adams 1971:18). The Navy developed 'TALOS' while the Air Force introduced 'WIZARD'. During this period, attention was also given to the problems of area and terminal defence system and soon the Air Force, which was using long, range radar interceptor aircrafts, was charged with area defence of the United States, and the Army was entrusted with responsibility for protecting military and civilian targets from surface-to-air missiles (Flax 1985:34).

If we visit history, we find that after dropping of the first nuclear bomb on Hiroshima and Nagasaki, President Truman assured that, "every new weapon will eventually bring some counter defense to it" and soon after this tragic incident and strategic speech, Soviet started to develop their own way to counter strategic the U.S. ballistic missile threat armed with nuclear warheads (Peoples 2010:78). In 1946, 'SCUNNER' (R-1A, SS-1a), the first Soviet LRBM, was developed by Sergey Pavlovich Korolev. It was actually a copy of a German A-4 (V-2) missile and marked the crucial beginning of ballistic missile development in the Soviet Union and exaggerated the global offensive and defensive warfare strategy rooted in missile developments (Afanasyev 1998:164).

In 1955, when the United State's intelligence report suggested that the Soviet Union would soon have ICBMs able to threaten the USA, the war planners of the U.S. switched the emphasis of its recently started project NIKE II, which was designed against air defence from anti-aircraft defence towards ABM defence (Spinardi 2009:356). This step is claimed by scholars as a significant mark in BMD history, as it sharply expanded antiaircraft missiles from which ABM eventually emerged. By the year 1956, Research and Development (R&D) programme was introduced by the Army Rocket and Guided Missile Agency (ARGMA), for the resolution of technical problems of defence, against ballistic missiles. After one year in 1957 Soviet had launched its first Sputnik-1 long-rang ICBM capable of carried SS-6 booster missiles into orbit, having weighed 184 pounds, after one month Soviet launched another satellite known as Sputnik-2 carried payloads of 1,121 pounds into orbit and in 1958

Soviet tested the Sputnik-3 satellite having weighed 2,926 (Carter and Schwatz 1984:30-31). However, as Peoples (2010:101) asserts that:

> SPUTNIK-1 created a crisis of confidence that swept America like a windblown forest fire. Overnight there developed a widespread fear that the country lay at the mercy of the Russian military machine and that American government and its military arms had abruptly lost the power to defend the mainland itself, much less to maintain US prestige and leadership in international arena (Peoples 2010:101).

The Soviet innovation of the world's first satellite anti-craft-SPUTNIK-1 had fundamentally jeopardized American strategic environment as it laid a road to the sky. Undoubtedly and necessarily, the United States started to initiate its space based missile R&D programme as damage control to its future strategies. In addition, the Air Forces' Scientific Advisory Board (SAB) was also established which after its in-depth analysis of overall situation recommended for consolidating missile and space programmes in the Department of Defense (DOD) and assigning them a top national priority (Goddard 2007:7).

In 1957, the army developed 'NIKE ZEUS', a system accomplished by radars and interceptor missiles for the destruction of incoming ballistic missile warhead. It was in practice, the first ABM armed with a nuclear warhead. In 1958, BTL, the main contractor for the project, triumphantly reported that it seemed possible "to hit missile with a missile (Zeijden 2007: 28)". By the year 1962, the 'NIKE ZEUS' system successfully intercepted 'Atlas D' missile which was the first operational inter-continental ballistic missile (ICBM) tested at Kwajalein Atoll and Vandenberg Air Force Base (California) to demonstrate the accuracy of technical capability of missile (Flax 1985:34-35). Despite the fact that the system was not effective enough to counter various dummy warheads, including decoys and penetration aids, it sets the research efforts in right direction so as to curb the technical problems of countermeasures. Next to it, a programme called 'Project Defender' was initiated by the Advanced Research Projects Agency (ARPA) to obtain an advanced system of defence, either supplementary to, or, extending beyond the present Nike-Zeus terminal intercept concept (Spinardi 2009: 356), and within a few months, R&D programme reported that a key component of an improved system would have to be a low-altitude interceptor capable of extremely high acceleration so that it could be fired late in the re-entry trajectory of the incoming warhead (Flax 1985:35) and make the system more accurate.

In 1963, R&D programme recharged itself and initiated a new project on BMD system. This project designated 'NIKE-X', also known as 'Sprint', incorporated by a low-altitude intercept capability and 'Phased Array Radar' (PAR), was able to intercept warheads up to an altitude of about 100 miles (Schneider 1969:5, Spinardi 2009: 358). Later the 'NIKE-X' system included area defence by incorporating high accelerated missile named 'Spartan' to intercept RVs within the atmosphere, at an altitude of 20 and 30 miles, by which time any decoys or other light weight penetration aids would have been stripped away by drag (Spinardi 209:357, Schneider 1969:6). Unfortunately, the NIKE-X system had never been deployed. As one former senior DOD official commenting on this project pointed out that,

> It was a very expensive terminal defense system which for a given amount of money could provide protection to some number cities, but leaving many totally unprotected, and it suffered the flaw of any terminal defense system, that every piece contributes to the cost but the enemy can choose where to attack and only a small part of the system can be brought to bear to counter such an attack (Schneider 1969:7).

However, the period of 1945 to 1964 marks the first generation of U.S ballistic missile defence.

2.4.1 SENTINEL AND SAFEGUARD MISSILE DEFENCE SYSTEMS

The period of 1963 to 1967, witnessed considerable changes in the strategic forces caused by the emergence of China as a new nuclear threat and accordingly, considerable attention was given in making the existing interceptor more effective to counter the hypothetical threat from Chinese. Working on such perception, on September 18, 1967, with the announcement of President Johnson, R&D programme began to build the 'Sentinel' system. With the Sentinel decision, the U.S. missile defence policy entered into its second period (Adams 1971:245). The system was, however, basically a modified Nike-X system, incorporating two types of new PAR, called the Perimeter Acquisition Radar (PAR) and Missile Site Radar (MSR). Since the range of Sentinel had been doubled and new PAR had been developed, it was able to protect a wide area against a light and unsophisticated attack from China (Adams 1971:241). A year later, on March of 1969, President Nixon called for reincarnation of the Sentinel into a new ABM system known as 'Safeguard'. The Safeguard used two types of missiles armed with a nuclear warhead: one was known as 'Spartan' while other 'Sprint'. The Spartan missile was able to destroy incoming ICBM, before they enter into the earth's atmosphere, while the Sprint missile provided a shield against such missiles those were not protected by Spartan defence.

2.4.2 THE JOURNEY FROM 1960s ABM DEBATE TO 1972s ABM TREATY

Various debates and discourses had emerged with the President Nixon's decision to proceed towards developing and deploying a Safeguard programme. A major reason for this debate was technological skepticism, with regard to the prospects for effective missile defence. Increasingly, the issue was fueling significant controversies within the scientific community which was called 'finite containment school' by Ernest J. Yanarella (Yanarella 2002:8). Much of this debate focused on whether or not to develop an ABM system. The key argument made by the 'finite containment school' was that the development of an ABM system would intensify the offensive and defensive arms race. Some of them strongly supported the Nuclear Non-Proliferation Treaty (NPT) and the Partial Test Ban Treaty (PTBT) and described any attempt to missile defence is virtually hopeless (Peoples 2010: 83). Accordingly, they showed greater faith in political negotiation for limiting nuclear arms race, which was also supported by the Defense Secretary of the U.S. Robert McNamara. While the 'finite containment school' viewed ABM as a symbol of arms race, another school of thought had emerged from the spilt within the scientific community itself, which viewed ABM as an instrument for national security. This group of thought what Ernest J. Yanarella has classified as the 'infinite containment school' (Yanarella 2002:8). This school showed greater concern for missile defence including offensive and defensive development of missiles. Simultaneously this debate had enlarged a greater public discourse especially from grass root level. All these efforts, eventually led to wider political setting on missile defence and by the year of 1972, the United States and the Soviet Union entered into the era of negotiations with the singing of ABM Treaty.

2.4.3 THE ABM TREATY

The effort to negotiate an agreement for arms control, which had been going on since 1960, got a fresh incentive after the singing of ABM Treaty at Moscow in May 26, 1972. This treaty imposed mutual renunciation of defence systems against SBMs in which it eliminated offensive incentives to build up nuclear capabilities (Ivanov 2000:15). “In other words, the rejection of the nuclear "shield" by the ABM treaty made the nuclear "sword" less dangerous (Ivanov 2000: 15)”. However, the main purpose of ABM treaty is to ensure strategic stability by retaining the Mutual Assured Destruction (MAD) as the cornerstone of security policy. As Holmes (1996:48) observed, the basic assumption behind the ABM Treaty was mutual vulnerability in which the use of nuclear weapon by one side would ultimately lead to the destruction of both sides. The treaty is, therefore, considered by many as a cornerstone of strategic stability. This achievement of ABM Treaty has had previous incarnations, as the Strategic Arms Limitation Talks- SALT I and SALT II and the Intermediate-Range Nuclear Forces (INF) Treaty, which limited the development of two types of nuclear weapons namely- intermediate-range and intercontinental-range missiles (Ivanov 2000: 15). All these treaties acted ‘as a strong bargaining chip’ in the negotiation of ABM treaty (Yanarella 2002:159).

However, a major change in the treaty made in 1974, by the amendment of Article III of the treaty. While the original treaty had permitted for the two ABM development sites both for the U.S. and Soviet Union - one to defend its national capital and the second one to defend ICBM silos; the 1974 protocol reduced the number of ABM development but permitting each to one development site (Rhinelander 2001:98). Additionally, the treaty had prohibited the development of multiple ABM launchers and interceptors at lunch sites. This provision was mentioned in Article III of the treaty in the following manner:

> Any country may have no more than 100 ABM launchers and no more than100 interceptors within the development area and having not more than 6 ABM radars must be located within one hundred and fifty kilometers (Schneiter 1984:223).

Simultaneously with this provision Article 1 states that:

> Each Party undertakes not to deploy ABM systems for a defence of the territory of its country and not to provide a base for such a defence and not to deploy ABM systems for defence of an individual region except as provided for in Article III of this Treaty (Mullerson 2001:513).

The 1972 ABM Treaty in many ways laid the foundations of the strategic stability. The special significance of the treaty lies in the fact that by prohibiting nationwide development of ABM system, it led in a major way to the signing of the Interim Agreement Treaty on strategic offensive arms. The treaty has, therefore, important implication over the offensive and defensive warfare of strategic arms race. Although this treaty in no way imposed an overall restriction on missile development, it did not prohibit or even limit research program on ABM system. As Cox and Moore (1986:74) remarks research being the classic kind of non-verifiable arms control, the parties did not seek to control it.

In contrary to this provision, Article V of the treaty prohibits the testing, development, or deployment of all ABM systems or components that are based in space, water, or air, or are mobile land-based (Sofaer 1986: 1973). Both of these provisions are logically contradictory which make widespread disagreements regarding the effectiveness of ABM Treaty.

2.4.4 BMD RESEARCH AND DEVELOPMENT PROGRAMME IN THE ABM TREATY ERA

The research on BMD technology has been in continuous operation ever since the inception of ABM Treaty. To quotes Yanarella "any effort to control technological advances while the cloak of secrecy veils part of the world would be technologically impossible and militarily foolhardy (Peoples 2010:85)." Research work after ABM Treaty was conducted on the basis of informal or an exotic way, but nevertheless effective, largely proceeded toward engineering rather than scientific development (Flax 1985:46-47). This shift in missile development was largely supported by the group of American think- tank what Peoples (2010:95) has classified as the 'Laser Lobby' (led by Republican Senator Malcom Wallop and Angelo Codevilla) and 'High Frontier' (led by General Daniel Graham and the Heritage Foundation think- tank).

> By 1977 Maxwell Hunter, a senior aerospace engineer, convinced that laser technology could, in near term, produced a revolution in warfare by ending the dominance of offensive strategic weapons, if we used to place such lasers in space, an effective defense against massive ballistic missile exchange is possible (Peoples 2010: 96).

Since then significant research efforts have been made to the development of laser technology, especially for space-based BMD system. The other area of R&D programme that pursued great attention was to protect hard point area such as ICBM silos from the enemy attacks. During initial years of 1980s, the U.S. army successfully launched the Low Altitude Defence System (LOADS) as a successor of the Sprint missile for the interception of counterattacks against ICBM silos (OTA 1986:57). At the same time on the opposite side of this spectrum, the Soviet Union started to initiate its own way to conduct R&D programme and gradually a major Soviet R&D programme was directed toward upgrading the Moscow ABM system. According to the report of OTA (1986:59) the upgraded Moscow ABM system has two-layer interceptors system: first layer composed of silo-based long-range modified GALOSH interceptors, and second layer composed of silo-based high acceleration interceptors, designed to intercept targets both within the atmosphere and outside the atmosphere. It has been observed by Moore (1986:74) that such development would not only violates the ABM Treaty but also involve a variety of other questions such as those concerning possible renegotiation of the treaty, possible withdrawal from the treaty. Hence in this context one can say that the violation of ABM Treaty has been a matter of growing concern rather than its effectiveness and existence. This matter became even more tempered by the President Ronald Reagan's decision to initiate SDI programme in 1983.

2.4.5 THE PROGRESS OF BMD RESEARCH IN THE STRATEGIC DEFENCE INITIATIVE ERA

The announcement of SDI or Star wars programme by the President Ronald Reagan on March 23, 1983, for developing more effective defence what he called 'leak proof' missile defence system has made a great departure from the 1972 ABM Treaty (Peoples 2010:94). A major reason for Reagan's decision to proceed towards a BMD research program with greater alacrity was his realization of the Soviet's aspirations to establish 'technological ingenuity in the realm of defences (Peoples 2010:94)'. Reagan had, therefore, viewed the Soviet Union as an unalterable threat to the United States and launched his comprehensive and intensive SDI research programme to eliminate the future strategic threat posed by Soviet missiles (Raffier 1996: 23). While the ABM Treaty had established the strategy of MAD with the threat of retaliation by offensive nuclear weapons, Reagan's SDI programme has replaced this strategy of assured destruction into assured survival with the defensive measures. Reagan had showed greater prospect for a technological breakthrough and hoped that it would be able to create such hardware that could not only intercept missiles but also render enemy missiles impotent and obsolete (Peoples 2010:137, Yanarella 2002:185).

However, SDI as a R&D programme was organized and managed by the DOD. According to the report of the United States General Accounting Office, the DOD, under the direction of Ronald Reagan had conducted two major studies for strategic defence: one was 'Fletcher Study' which tried to evaluate the feasibility of missile defense technologies for the interception of threat of nuclear ballistic missiles, and the second entitled 'Future Security Strategy Study' popularly known as the Hoffman Study, which assessed the role of defensive systems and their implications for defense policy, strategy, and arms control (GAO 1993:19). At this point of history, the Congress also conducted a separate arms research programme known as the Office of Technology Assessment (OTA) to study the space-based missile defence programmes (Yanarella 2002: 192). The major finding of the SDI programme was multilayered BMD system for the inception of ballistic missiles in its all phases of trajectory from the boost phase to the terminal phase. In parallel with these developments, various types of lasers were also developed by the SDI which included infrared chemical lasers, Kinetic energy, electrically driven ultraviolet lasers, free-electron lasers, and X-ray lasers.

Although these achievements successfully demonstrated the feasibility of SDI, yet it also provoked wider controversies. Many opponents of SDI argued that the 'testing of space based and exotic missile defense technologies'[7] by the SDI violates the provisions of the ABM Treaty. In 1989, when George H. W. Bush entered into office, he critically reviewed all the elements of SDI programme. According to the GAO (1993:29) report the major recommendation made by the team of George H.W.

[7] There was no provision for exotic missile technologies in the original text of the 1972 ABM treaty. President Reagan had inserted this provision to the ABM treaty that would allow for the deployment and testing of newer exotic systems and space-based systems (Hildreth 2007:4)

Bush was the replacement of SDI's 'Brilliant Pebbles'[8] into the boost surveillance and tracking system. Yanarella (2002:201) argued that this type of Brilliant Pebbles interceptor would act as insurance against reckless nuclear strikes and provide a shield against the destruction caused by accidental missile firings. By 1991, President George H.W. Bush called for a new defence system named as Global Protection against Limited Strikes (GPALS).

A more sensible gesture to develop limited national ballistic missile defence was made by Bill Clinton when he became the President, and his pessimism towards the development of National Missile Defence (NMD) was also supported by Les Aspin, the then Secretary of the U.S. Defense Department. However, in May 1993, Les Aspin by the renaming of Strategic Defense Initiative Organisation (SDIO) into newly entitled the Ballistic Missile Defense Organization (BMDO); he declared "the end of the star wars era (Peoples 2010: 217)." The new Ballistic Missile Defense Organization (BMDO) has established multiservice missile defence agency to design and develop Bill Clinton's highly optimistic goal of NMD system (Gansler 2010:46).

2.5. THE CURRENT DEVELOPMENT OF BALLISTIC MISSILE DEFENCE

"*As technology spreads and improves the security threats beyond our borders and the security expectation within our borders both increase* (Peoples 2010:219)" [Originally not in italic].

Modern era of BMD has begun in 1991 when Iraq launched a SCUD missile against the U.S. military troops at Dhahran State of Saudi Arabia. Undoubtedly, and necessarily, the event led to greater alacrity for developing BMD and the emphasis shifted from the development of SMD to the development of 'Theatre Ballistic Missile'[9] Defence (TBMD).

---

[8] Brilliant Pebbles a space-based interceptor designed by SDI research programme associated with thousands of individual interceptors, each with its own surveillance capability and enough computing power would able to operate autonomously (GAO 1993 :28)

[9] In contrast to the long- range ballistic missile threat, the TBMs armed with nuclear-, chemical-, or biological-weapons pose a greater threat, as these weapons are increasingly used in recent years by the rough states. " Although no potential adversary other than Russia possesses TBMs capable of striking the United States, both China and North Korea are developing missiles that will likely have that capability by 2015((Wood et al. 2005:745)". Whereas in contrast to TBM very few countries are able to possessing long range intercontinental-range ballistic missiles (Lyon and Dellit 2010:445). Currently six countries have long range intercontinental-range ballistic missiles capabilities, namely- 'USA, Russia, China, France, Britain and India (NDTV 2012).

2.5.1 THEATRE BALLISTIC MISSILE DEFENCE

The TBMD system is designed to destroy multiple types of threats posed by short range ballistic missiles. It was

> In the sixties and seventies the first theatre missile defense 'PATRIOT' was designed to defend airspace and was subsequently upgraded and redesigned in the eighties as a point defense to protect military troops against short range offensive missile like 'SCUD'[10](Yanarella 2002:203).

TMD system consists of four tiers: ground-based lower tier and ground-based upper tier, sea-based lower-tier system and sea-based upper-tier (Matsumura 1998:158). The examples of lower tier TMD system are Medium Extended Air Defense (MEADS), Phased Array Tracking Radar Interceptor on Target (PATRIOT), SAMP-T; the examples of upper tier TMD system are THAAD capable of protecting only a limited amount of territory from slower, shorter range TBMs (Toms 2008:4). The example of sea-based lower-tier system is the AEGIS, and the examples of sea-based upper-tier are Navy Theatre-Wide Defence (NTWD) system, also known as the Lightweight Exo-Atmospheric Projectile (LEAP) [Matsumura 1998:158].

Although the TMD has very limited anti-missile capabilities but nevertheless effective, contributing to the defence of troops that could cover wide areas. In the words of Zeijde (2007:25), TMD provide defence for anything from fixed territories on the ground to ships, airspaces and moving troops on a battlefield. This part of TMD is, of course, subject to greater controversy, as it makes some complexities in demarcating the line between strategic defence and theatre missile defence. In 1997, the United States and Russia signed the Demarcation Agreement that would allow TBMD up to 3500km (Grand 2001: 47). The 1972 ABM Treaty though imposed mutual restriction on the development of this type of ATM defence system. The U.S PATRIOT missile in Persian Gulf War during 1991 had successfully demonstrated the capabilities of TMD. In the United States, the major developmental work on TMD had occurred during 1993 as a result of the appointment of Les Aspin as Secretary of Defense. In fact, "the lesson that Aspin took from the Gulf War was that theatre

[10]"A missile based on Russian innovations in rocketry during the late 1940s and early 1950s capable of carrying a roughly 1-ton payload from Iran to the United States would weigh about 120 tons (Postol and Lewis 2010 pp.12-13)."

defences were paramount and technically, militarily and financially distinguishable from national defences (Peoples 2010:217)."

Accordingly, the spread of ballistic missile technology and greater accuracy for their defence led to the regional development of TMD system. While the Israel initiated ARROW missile interceptor, France developed SAMP-T ASTER TMD system (Rance 2001: 38). The SAMP-T interceptor system is particularly designed to destroy SRBMs with a range of less than 600km, in addition to aircraft, UAVs (unmanned combat air vehicles) and LACMs (land-attack cruise missiles) [Toms 2008:22]. The system of SAMP-T interceptor consists of "a command and control vehicle, arable radar and up to six Transporter Erector Launcher (TEL) vehicles, each with eight missiles and a store of reload missiles particularly uses MAGICS (modular architecture for graphics and image console systems) and MARA (modular architecture for real-time applications) computers (Army-Technology 2012)"[11]. Meanwhile the 'Rumsfeld Commission'[12] established in 1998 reported that the North Korea has launched a three-stage Taepodong rocket missile equipped with biological or nuclear warheads (DeBiaso 2006:161). This newly emerged catastrophic environment, as claimed by the U.S. scholars forced the United States to proceed towards the development of NMD. The best example of this type of defence is THAAD system and the AEGIES SM-3 missile interceptor system.

BMD has thus become a growing concern for global security. It has recently been analyzed by Peoples (2010:1) which says that the contemporary global security agenda is dominated by various issues, BMD is seen in central. Today,

> The United States and Russia both face new threats to their security. Principal among these threats are weapons of mass destruction and their delivery means wielded by terrorists and rogue states. A number of such states are acquiring increasingly longer-range ballistic missiles as instruments of blackmail and coercion against the United States and its friends and allies (Schmidt 2008:1).

While the TMD may act as a shield against the destruction caused by unauthorized and accidental launch of ballistic missiles by small states, the

[11] Army-Technology (2012), "Aster 30 SAMP/T – Surface-to-Air Missile Platform / Terrain, Europe", [Online: web] Accessed 15 May 2012 URL: http://www.army-technology.com/projects/aster-30/

[12] Rumsfeld Commission: "A congressionally chartered panel that reviewed the existing and potential ballistic missile capabilities of other nations and the likelihood that such capability would constitute a threat to the United States (CDI 2000).

development of a national ABM system became the first priority of the Bush administration. It was clearly evident by the statement of George W. Bush that his mission would be to "deploy ABM at the earliest possible date (Peoples 2012:160)." Rather than extending R&D programme on BMD, Bush proceeds with exponentially toward the development of a new framework to build more effective missile defences that could counter the different threats of today's world. In addition to the development and improvements of new technologies and strategies, he challenged the 1972 ABM Treaty, one of the foundations of cold war strategic stability. Regarding the ABM Treaty he commented that "the ABM Treaty and any other treaty that inhibited American's potential to develop defense for itself and others could not be tolerated (Peoples 2010:182)." By the middle of the year 2001, the twin tower destruction by terrorist attacks in America, gave rise to the fear of what once Reagan has described "window of vulnerability' (Peoples 2012:160). President Bush viewed the increasing number of small nuclear States and the spectre of Al Qaeda what he called 'axis of evil' as an unalterable threat to the United States (Yanarella 2002:216) and explicitly reinforced the view that:

> We need new concepts of deterrence that rely on both offensive and defensive forces. Deterrence can no longer be based solely on the threat of nuclear retaliation. Defences can strengthen deterrence by reducing the incentive for proliferation. To do so, we must move beyond the constraints of the 30-year-old ABM Treaty (Rusten 2010:1).

This announcement of President Bush re-opened the discourse over missile defence. Although the debate is not so much about the desirability of BMD rather it is about the incompatibility of deterrence and defence. While the logic of this debate is reasonable, the process of developing a BMD remains constant and by the year 2002, a Ground-based Missile Defence (GMD) system was developed by the U.S Missile Defense Agency (MDA). After one year, again in 2003 two missile interceptors were successfully tested at Fort Greely and Kodiak Island in Alaska (Yanarella 2002:215). With these developments, Bush initiated an interest in pursuing space for missile defence. Next to it,

> The US Air Force and US Space Command have also designated space as within Joint Vision 2020's mandate of full spectrum dominance to disrupt, degrade, deny or disrupt enemy space capabilities in future conflicts (Peoples 2010: 210).

2.6 SUMMARY

This chapter argues that BMD is a practical reality. This claim is made on the basis of the three scenarios, two scenarios from historical events and the third one based on hypothetical event.

First, it was in 1944 Germany, first of all, launched the ballistic missile and undoubtedly demonstrated the existence of such destructive war weapons. Although, it is true that German scientists discovered the idea of ballistic missile, however, most of their ideas were materialized, upgraded and redesigned by the USA. In spite of that many proponents of missile defence believe that development of offensive ballistic missiles under the ABM Treaty would be able to contribute to secure deterrence which in turn could ensure the strategic stability. In this context, we can say that 'the integration of ABM into an overarching deterrence by the two superpowers' subsequently legitimised the concept of missile defence (Yanarella 2002: 217).

Second, the 1991 Gulf War led to the new era in BMD. This proposition has been found with depth analysis by Peoples (2010) which is considered as a source of inspiration to missile defence as it successfully demonstrated the feasibility of the U.S. Army's PATRIOT (ATBM) system. However, it must be noted that this event was seriously taken by the missile advocates more for its future strategic threats than its technological breakthrough.

Third, BMD is no longer stuck with technological uncertainty; it is a reality now and has been successfully demonstrated many times over the past few years. However, the present existence of BMD is largely determined by the future hypothetical threats, which according to many does not exist. Yet, even with this skepticism, missile defence is an important aspect for security and still considered as a means to ensure strategic stability. As some experts believe that the future may bring some new event that might demonstrate the indispensible role of BMD for the future strategic stability.

The three scenarios make a point of continued exploration and deployment of BMD system (Gansler 2010:8). Though these events have not always been credible or successful they gave sufficient reasonable ground to build defence. As Peoples (2010) considers the history of technological development of missile itself as the final best proof of the potential for missile defence.

However, the key to understand the advocacy of missile defence lays in its broader strategic and administrative forces that had shaped different policies and programs in missile development. A highly significant influence on missile defence in this regard was President Reagan's SDI which is characterized by an almost restless and unceasing search by missile advocates to discover and carve out a mission for defensive technology (Yanarella 2002:229). In fact, this witnessed a major turning point in the realm of missile defence advocacy as it leads to entirely a new policy of defence which ultimately breaks the strategy of MAD. The Clinton administration contributed little for missile defence as he explicitly renounced aspirations of NMD (Peoples 2010:217). But the need of a defence and the sense of threat from missile attack did not die. In an attempt to give a new framework of missile defence, Bush announced his withdrawal from the ABM Treaty (December 13, 2001). This, indeed, gave extremely important shift in the U.S. strategic policy, and one which this paper's argues have far reaching implications in the contemporary missile defence debate, because it lead to a complete departure from the cold war strategy of MAD, and most importantly it ensured that missile defence remained as a dream of security that would yet not achieve. In nutshell, "the promise of a technological solution was deem to be worth every investment necessary to free the world from the threat of nuclear war (Peoples 2010: 125)."

CHAPTER 3

BALLISTIC MISSILE DEFENCE SYSTEMS OF VARIOUS COUNTRIES

3.1 INTRODUCTION

The U.S. centric development of ballistic missile defences as explored in previous chapters posed threats to several countries with which the U.S. was competing either during Cold War such as Russia or other countries which USA saw as its potential rival in future such as China. Under the underlying policy of Morgenthau's balance of power, these countries rushed to enhance their defensive mechanism so as to also sharpen their offences at the same time (Amin 2011). The communication, rocket and satellite revolutions whereas helped India to develop its own indigenous Ballistic Missile Defence (BMD); Israel has developed a strong BMD with the help of the U.S. to counter the greater threat from its hostile Arab neighbours. This chapter attempts to analyse BMD systems of these selected countries while focusing on their technology, process, ranges and effectiveness along with the perceived threats. This part of architecture has of course strategic importance as the location, interceptor technology identify the capability of BMD system (Grand 2001:44).

Historically, as explained in chapter 2, the United States was the first country which mooted the idea to develop BMD to counter the destructive incoming enemy ballistic missiles under its several research programmes and projects, which was later on escalated under Cold War rivalry. Whereas, Chapter 2 focused on developing a framework for analysing the conceptual understanding and evolution of BMD, this chapter primarily focuses on individual countries and their BMD systems.

While drawing attention on various BMD systems of different countries, the purpose of this chapter is not to make an assessment on missile proliferation rather to try and find out technological configurations by which the very BMD systems are being constructed. For the sake of convenience, this chapter is divided into five sections, each deal with one particular country's BMD systems and possible technological architecture of these systems. In the first section particular attention will be paid to the U.S. BMD systems. The approach here is to explain the major BMD systems of the U.S. including ground- based mid course defence, multilayered BMD consisting of PATRIOT, AEGIS, and Theatre High Altitude Area Defence (THAAD) Systems. The second sections will analyse Russian BMD systems and their components. In doing this it will discuss three different phases of technological development for Anti-Ballistic Missile (ABM) in Russian from the ABM-1 to ABM-2, and ABM-2 to ABM-3. The third sections will focus on China's ABM systems including FanJi 1, FanJi 2 and FanJi 3 and in the final two sections: fourth and fifth, attention will be paid on India's and Israel's BMD systems. Such systems include Israel's Arrow missile, Iron dome missile and India's Prithvi Air Defence (PAD) and Advance Air Defence (AAD). The analysis also incorporates discussion of India's surface to air missile defence system known as Akash.

3.2 BACKGROUND

The world wide proliferation of defensive ballistic missile systems began with the end of cold war. Technological advancements in weapons systems and developments of laser and particle beams, new interception technologies, along with effective guidance and sensing systems, optics, and computer processing systems seemed to make BMD more attractive than it had in the past (Bethe 1985:53). Today more than 32 countries possess BMD capabilities (Klingner 2011:1). China and Israel pursued ballistic missile systems of their own between the late 1950s and the late 1970s (Riper 2004: 89). By the year 1986 Israel had started to develop its Arrow anti-tactical missile system. In this context India has been developing a series of air missile defence systems. While AAD missile was developed by India for endo-atmospheric interception, the PAD system was developed for exo-atmospheric interception. Although India has developed both endo-atmospheric and exo-atmospheric missile defence system, it has focused on Israel's Arrow missile and extended air defence capabilities with the objective of building Anti-Tactical Ballistic Missile or ATBM system (Kumar 2008a:175). Currently China is developing its robust ABM system under 'PROJECT 863'. Simultaneously, Russia has significantly increased the quantity and quality of its medium range surface-to-surface missile inventory (Harmer 2012:1). While Russia has developed 'a unique BMD architecture comprising the ABM-1, ABM-2, and ABM-3' the United States has developed a multilayered BMD system (Kumar 2008a:175). The current developmental programme of the U.S. multilayered BMD system consists of the PATRIOT Advanced Capability-3 (PAC-3), the AEGIS BMD and the THAAD system.

3.3 UNITED STATES BALLISTIC MISSILE DEFENCE SYSTEM

The United States has divided its BMD system into two categories: National Missile Defence (NMD) and Theatre Missile Defence (TMD) systems (Palmore 2003: 369). NMD is the part of broader ambit of TMD system. It came under the category of upper-tier TMD systems (Rance 2001:39). There exists fundamental differences between the operation of lower-tier TMD and upper-tier NMD because NMD has wider capability as compared to lower- tire TMD (Grand 2001: 47). The newly proposed NMD system was designed to defend all 50 states of the USA including Alaska and Hawaii against a limited number of Intercontinental Ballistic Missile (ICBM) attacks armed with weapons of mass destruction (Rance 2002: 39). Such attacks can be categorized into three stages: "a small accidental or unauthorized attack from Russia, a deliberate or unauthorized attack from China, or a deliberate attack from a hostile emerging missile states such as Iran, Iraq, and North Korea (Lewis et al. 1999-2000:120)."

However, in order to diffuse the Russian threats of counter reaction, the U.S. strategists' claimed that NMD has very limited capability designed against rising small nuclear powers rather than Russia. Some scholars also argue that NMD would be neither effective nor able to counter any type of sophisticated and high-volume attacks from either Russia or China (Gansler 2010: 8). However, recently President George W. Bush decision to go unilaterally, deviating from existing norms drew severe condemnation worldwide which primarily focused upon analyzing the future implications of accelerating NMD system (Deutch, et al 2000: 91). In order to strengthen NMD, President George W. Bush officially declared the United State's withdrawal from the ABM treaty and "began deployment of the Ground-Based Midcourse (GMD) national missile defence system" (Mostlymissile Defense 2012).

3.3.1 COMPONENTS OF NATIONAL MISSILE DEFENCE SYSTEM

The idea to construct U.S. NMD system goes back to President Clinton's era, as for the first time under his leadership the U.S. "started to pursue a strong, sensible national missile defense program based on real threats and pragmatic responses (Futter 2011a:102)”. Clinton administration designed the 3+3 plan to build NMD system. The U.S. 3+3 plan basically attempted to develop the NMD system under three different phases: (I) capability-1 (C-1), (II) capability-2 (C-2) and (III) capability-3(C-3). The first phase (C-1 system) consisted of 20 interceptor missiles accompanied with single X-band radar and an operational system called C2BMC (command, control, and battle management and communications network). C-1 system was designed to be placed in Alaska (Futter 2011a:102). The second phase (C-2 system) was supposed to consist of 100 interceptor missiles placed in Alaska, Great Britain and Greenland accompanied by one acquisition radar and five early-warning radars (Deutch, et al. 2000: 91; Futter 2011a:102)**.** The third phase (C-3 systems) aimed to have approximately 250 interceptors, placed at two different locations - Alaska and North Dakota. C-3 system also has an additional X -band radar placed at the U.S. coast and in South Korea (Futter 2011a:102). Presently, the United States is developing NMD system under the programme known as Ground-Based Mid Course Defence (GMD) system.

3.3.2 GROUND -BASED MID COURSE DEFENCE (GMD) SYSTEM

For long range ABM system, the U.S. has developed three- stage solid-propellant GMD System (Obe 2011:357-359). The first two stages has a intercepting range between 3,500-4,000 km while the third stage has a range up to 5,000 km (Obe 2011:357-359). The Ground-Based Interceptor (GBI) missile is developed at soil and placed at two separate locations namely- Fort Greely, Alaska and Vandenberg airbase in California (Peoples 2010a:1, Pant 2005:228). This system would be able to protect the U.S. against attacks having 25 warheads approximately (The Adelphi Papers 2000a: 29). Some high-altitude sensors, for example the Defence Support Program (DSP) satellites along with the Ballistic Missile Early Warning System (BMEWS) and a new X-Band Radar (XBR) have also enhanced the capability of GMD system (Yong and Yingbo 2003:152, Rance 2001: 39). The BMEWS was developed to provide radar the advanced capability to search and track the target. This system is located in Greenland (Thule) and Alaska (Clear) and Britain (Fylingdales) [Peoples 2010a: 103]. The BMEWS at Britain (Fylingdales Moor, an inland from Whit by in the North Yorkshire Moors National Park) is particularly designed to provide early warning of Soviet nuclear-armed ballistic missiles to the United States (Spinardi 2007:87). However, DSP satellites has replaced by the Space-Based Infra-Red System (SBIRS) which includes four satellites in geosynchronous orbits and two more in highly elliptical orbits (Obe 2011:358). The GMD program is different from both C-1 and C-2 systems and is designed to replace the C-3 system with more advanced technological system.

Table: 1.1 Summary[13] of the whole architecture of C-1, C-2, C-3 (NMD) and GMD systems:

Systems	Interceptors	Radars	Warheads	Placement
capability-1 (C-1)	20	Single XBR on Shemya Island in the Aleutians	few, simple warheads	Alaska
capability-2 (C-2)	100	one acquisition radar and five early-warning radars	five warheads	Alaska, Great Britain and Greenland
capability-3 (C-3)	125 interceptors for Alaska and 125 interceptors for North Dakota	One ballistic-missile early-warning radar and an XBR tracking radar is employed in South Korea and four additional XBR at Beale Air Force Base, Cape Cod and Grand Forks, and in Hawaii.	More than five warheads	Alaska and North Dakota
The GMD system today	26 in Alaska and 4 in North Dakota	A Sea-Based X-Band Radar (SBX) has developed at Adak in Alaska.	25	Fort Greely Alaska and Vandenberg airbase in California

[13] Sources: Sessler et al. 2000:20, The Adelphi Papers 2000a:29-33, People 2010a:1, Futter 2011a:102 Deutch, et al. 2000:91, Mostlymissile Defense (2012), Obe 2011:325.

The composite picture of all these systems has over a period of time under intensive research and resource diversions led the United States to develop a multilayered BMD system (Kumar 2008a:173). This system employs various elements of Sea-Based Radars (SBR) and interceptors, GBM defence and satellite-based sensors' to ensure the accuracy of interception and develop an effective countermeasure against potential missile threats (Peoples 2008b:20). One of the important sea based interceptor of multilayered missile defence is known as AEGIS BMD system. The programme of AEGIS BMD system is managed by the U.S. Missile Defense Agency (MDA) and by the Navy (O'Rourke 2012:1). "Under current MDA and Navy plans the number of BMD-capable Navy AEGIS ships is scheduled to grow from 24 at the end of FY2011 to 38 at the end of FY2018 (O'Rourke 2012:1)."

3.3.3 DESCRIPTION OF THE AEGIS BMD SYSTEM

The U.S. Advanced Electronic Guided Interceptor System popularly known as AEGIS is a computer-based combat defence system, used by the U.S. Navy surface vessels, which is capable to operate simultaneously against a variety of surface, underwater, and air threats (CDI 2000: 49)."[14] The current AEGIS BMD system is, however, basically a modified AEGIS Combat System, incorporated by the AN/ SPY-1 radar, the MK 41 Vertical Launching System (VLS), the Standard Missile (SM-3)[15] and the ship's command and control system (Defence Industry Daily 2012). The Vertical Launching System (VLS) is designed primarily to provide communications links for missiles and their Weapons Control Systems (WCSs) [Schneider 1987:3-6]. This system uses three canister configurations: the HX-13 for SM, the MK-14 for Tomahawk Land Attack Missile (TLAM) and the MK-15 for ASROC (anti-submarine rocket) [Schneider 1987:3-6]. The AN/SPY-1 Phased Array Radar (PAR) is intended for repeatedly tracking multiple targets so as to operate simultaneously and maintaining constant surveillance of the sky from the wave tops to the stratosphere (Strock 2012: 84) .

[14] For more detailed information see Allen, R. and D. Garlan (1996) 'A case study in architectural modelling: The AEGIS system', URL: http://www.cs.cmu.edu/afs/cs/project/able/ftp/aegis-iwssd8/aegis-iwssd8.pdf

[15] The Standard Missile 3 (SM-3) is used for midcourse phase defence while the Standard Missile 2 (SM-2) is used for terminal phase defense (Toms 2008:25)

The configuration used by this new AEGIS BMD is called 3.6.1 version which includes the BMD weapon system teamed with the advanced SM-3 Block IA missile (Brad et al. 2012:70, O'Rourke 2012:1). As compared to earlier SM-3 missile variants, the SM-3 Block IA missile has possessed greater range, superior speed, and advanced discrimination capability and all of these features make AEGIS BMD more effective against existing threats; with the help of an entirely new mission called Engage-on-Remote (EOR) [Colombo et al 2012:754]. "The AEGIS has performed dual functions of being a first-tier interceptor on the high seas as well as a forward-deployed early warning system if the first interception opportunity is lost (Kumar 2008a:174)". With regard to the NMD, "AEGIS BMD is employed for its claimed ability to produce monitored sensor data about moving objects (in case of any types of missile threats) within a ship's field of detection (Peoples 2008a:20)". In recent years, the value of AEGIS BMD capabilities has accelerated globally, in particular when President Barack Obama made an announcement for operating BMD-capable 'AEGIS ships'[16] in European waters to defend Europe from potential ballistic missile attacks from countries such as Iran (Brad et al. 2012:74; O'Rourke 2010:1). Accordingly, four U.S. AEGIS BMD capable warships were recently placed in Rota, Spain, for bolstering combined naval capabilities in the Mediterranean Sea, and to ensure security of European countries (Brad et al. 2012:66).

3.3.4 THEATRE HIGH ALTITUDE AREA DEFENCE SYSTEM

The U.S. BMD at the national level incorporates upper tier TMD systems of which THAAD system is an increasingly important component for a robust national BMD System (Brad et al. 2012:65, Peoples 2008a:23). According to Obe (2011:383) THAAD would be able to provide the upper layer of defence above existing PATRIOT-3 interceptor, intercepting ballistic missiles in the high endo-atmosphere and exo-atmosphere. However, a major disagreement exists with regard to the role of THAAD at national level. Many analysts claim that if THAAD system would be used as an elements of the U.S. NMD, it would violate the provisions of TMD Demarcation Accord dedicated to strengthen ABM Treaty by reducing ballistic missile threats between rival superpowers (The Adelphi Papers 2000b:53), because

[16] "The U.S. Navy's cruisers: CG-47s, Ticonderoga-class and destroyers: DDG-51s, Arleigh Burke-class are called Aegis ships. A total of 22 CG-47s and 62 DDG-51s are in service of 21 are currently equipped with BMD capability (Riqiang 2011:92)."

when the U.S. defence system increases its number of launching location sites across the globe along with excessive number of interceptors and their ranges reasonably required to defend the North American continent the U.S. actually starts posing threats to bigger powers like Russia and China, for example the increased number of defended the U.S. area locations from original 140 to 1400 across the globe actually perceived by Russia as an attempt to block more than 20% of its total ballistic missile retaliation (The Adelphi papers 2000b:55). Here overemphasis on defence in upper area reasonably required to counter threats at lower level within North American continent, USA actually is circumventing its national defence against Russia and thereby prompting Russia to increase its ballistic missile offence and defence both leading to frustrate the actual intent of ABM Treaty.

3.3.5 DESCRIPTION OF THAAD SYSTEM

It was President George W. Bush who planned to use the THAAD for strategic defence and classified theatre system as a terminal system (Yong and Yingbo 2003:152). In 2004 the system is given a new named entitled as the Terminal High Altitude Area Defence (THAAD) [Obe 2011:383]. THAAD is a GBM interceptor, having a range up to 300 km (Obe 2011:383-384). This system is designed to destroy a wide range of incoming tactical and TBM threats including short-range and long-range missiles in the 100 to 3500 km range bracket, largely outside the atmosphere (Yong and Yingbo 2003:154; Rance 2001: 39). This system would be able to protect the U.S. against theatre missiles attacks having warheads at altitudes of between 40km and 150km (The Adelphi Papers 2000b:47). The THAAD system is composed by a hit-to-kill interceptor using infra-red system, a launcher, and interceptor missile, the THAAD Ground-Based Radar (GBR), and a C2BMC communication system (command, control, battle management and communications network) and Intelligence BM/C3I system (Yong and Yingbo 2003:154, The Adelphi Papers 2000b:47). While the THAAD GBR is designed with an upgraded Phased-Array XBR having a range of 500km primarily intended to discriminate decoys from warheads, the BM/C3I system is designed for the integration of air defence and air assets (The Adelphi Papers 2000b:47, Toms 2008:26). One important features of THAAD system is that it largely “operates in the upper layers of the atmosphere where some countermeasures such as lightweight decoys, will no longer be effective (Yong and

Yingbo 2003:189).” However, in 1983, the U.S. army re-configured the THAAD and added more propellant kill vehicles to increase its maximum hit-to-kill capability against ballistic missile threats (O’Halloran and Foss 2010:447) which was further aggravated by recent the U.S. deployment of X-Band THAAD radar in the Japan to protect its friends and allies against intercontinental ballistic missiles and medium range threats (Toms 2008:26).

3.3.6 PHASED ARRAY TRACKING RADAR INTERCEPTOR ON TARGET OR PATRIOT MISSILE DEFENCE SYSTEM

For theatre missile defence system, the United States has developed the PATRIOT missile system. It is a short- range missile interceptor largely used in the battlefield (Futter 2011a:3). The PATRIOT missile is designed to provide terminal defence capability against ballistic and cruise missiles (Wood et al. 2005:745). “It consists of a mobile launcher, a phased-array air search-and-tracking radar, various command and support vehicles (Wood et al. 2005:745-746). PATRIOT is also the foundation of the U.S army’s integrated air and missile defence architecture designed to defeat long-range advanced missile threats including tactical ballistic missiles (Raytheon 2003-2006).” The PATRIOT missile has been used in operation Iraqi freedom and successfully achieved its operational capability in the anti-missile role (Harmer 2012:7, Wood et al. 2005:745). Further, it also “provided a national missile defence capability for Kuwait, which was being targeted by Iraqi forces after the U.S. invasion (Peoples 2008:23).”

Though the idea to develop the PATRIOT system emerged in the early 1960s, it was in 1976 when the U.S. army made a significant step by developing MIM-104A PATRIOT with heavy Electronic Countermeasures (ECM) to provide defence against aircraft (Obe 2011:367). According to the report of the U.S General Accounting Office (GAO 1992:2) initially PATRIOT system was employed to operate in Europe against Soviet missiles roving at speeds up to about MACH 2 (1500 mph). Subsequent development programmes were initiated to upgrade the capability of PATRIOT system against ATBMs (Harmer 2012:7). This programme has proposed three development phases to upgrade the PATRIOT system: the PATRIOT Advanced

Capability–1 (PAC-1), the PATRIOT Advanced Capability–2 (PAC-2), and the PATRIOT Advanced Capability–3 (PAC-3).

3.3.6.1 THE PATRIOT ADVANCED CAPABILITY PHASE–1 (PAC-1)

The MIM-104A PATRIOT missile forms the basis of PATRIOT advanced capability–1. The system has a range up to 70 km (Obe 2011:370). The PAC phase-1 interceptor has changed the software equipments of previous system and reconstructed the phased array radar search system (Obe 2011:367). These software changes provided radar, the capability to intercept inbound missiles at a high altitude (Sherman 2003: 34). Further, this system is also equipped with a solid propellant rocket motor which uses an upgraded MIM-104B phased array tracking radar having a weight of 914 kg, designed primarily to defeat jammer aircraft (Obe 2011:367-369). It is reported that, in the first flight test in 1986 the PAC-1 interceptor has successfully intercepted a 'Lance missile' similar to the Soviet SS-21 (Sherman 2003: 34).

3.3.6.2 THE PATRIOT ADVANCED CAPABILITY PHASE 2– (PAC-2)

The PAC-2 is an upgraded version of the PAC-1 interceptor. The system is designed to defeat longer range Intermediate Nuclear Forces (INF) such as the Soviet SS-23 (Sherman 2003: 34). The PAC-2 would have a rage up to 250 km (Obe 2011:370). 'The missile uses a blast fragmentation warhead to intercept the target (Missile Defence Agency 2010)'. Like PAC-1, the PAC-2 has a solid propellant rocket motor that accelerated Mach 3 speeds (Sherman 2003: 34). The interception capability of the system was first tested in 1987 and was used against Iraqi missiles during the Gulf War (Obe 2011:367).

3.3.6.3 THE PATRIOT ADVANCED CAPABILITY–3 (PAC-3)

PAC-3 is the new variant of PAC-2, designed with a new hit-to-kill interceptor. This new hit-to-kill interceptor provides PAC-3 the capability to hit targets up to an altitude of 30 km (The Adelphi Papers 2000b: 46). The PAC-3 system currently consists of 1,012 Erint hit-to kill interceptors and enables the system to operate in conjunction with 20 PATRIOT batteries having 48 missiles each (The Adelphi Papers 2000b:46). It is a single stage missile interceptor having a range up to 15 km particularly designed to provide defence against shorter range air-breathing threats and tactical ballistic missiles (O'Halloran and Foss 2010:441; Peoples 2008b:23). This system is also equipped with a weapon control computer management centre to track and intercept the target (GAO 1992:4). All these sophisticated technologies make the PAC-3 system ideal for air defence system (Kumar 2008a:173).

3.4 RUSSIAN BALLISTIC MISSIEL DEFENCE SYSTEM

Developments of BMD in the U.S. also increased Russian interest in missile defence under heated cold war rivalries. The development of BMD system is not a new idea for Russia as USSR had started to develop an ABM even prior to the signing of the ABM treaty in 1972. If we analyse USSR defence strategy, we find that Soviet initiated a research programme on nationwide BMD in 1950 itself and after one year it successfully tested missile interceptor which further stimulated research on NMD (Gobarev 2001: 37). In later phases of development around 1960s, two new mission areas – 'anti-satellite operations'[17] and ABM defence – were added to the National Air Defence mission (Jb2ookworm 2008)."

3.4.1 DESCRIPTION OF RUSSIAN/ SOVIET ABM DEFENCE SYSTEM

Soviet Union during its earlier phases of cold war rivalry conceptualized the understanding of ABM as a system,

> Intended for the disruption of nuclear missile strikes on the most important objectives by means of the disruption of ballistic missiles or their components in trajectory and the most practical method of anti- missile defense is missile against missile (Davis et al 1980:54).

This serious thinking for ABM by the Soviet Union led their strategic thinkers to develop 'TARAN'[18]ABM system. After a year, the A-30 missile was developed as a part of Soviet ABM system which gave a generational improvement over the U.S. Sprint missile (Obe 2011:289). The original A-30 ABM had a single nuclear warhead and was designed to intercept the incoming enemy missile within 'the atmosphere

[17] The anti-satellite system (ASAT) is designed with missile boosters to carry satellites with fragmented warheads into orbit to destroy a satellite target(Obe 2011: 291)

[18] Taran missile system was proposed in 1963 by the Chief Russian missile Designer V. Chelomei (Gobarev 2001: 37). The system was designed with a nuclear combat component to intercept incoming ballistic missiles at long range (Gobarev 2001: 37).

below 120 Km altitude'[19] by engaging the command of radar (Obe 2011: 289-290). The system consisted of one solid- propellant motor and an High Explosive (HE) fragmentation warhead for directing and commanding the target, having a range of 80 km and weight up to 10,000 kg (Obe 2011:290).

The A-30 missile was later replaced by the A-35 Moscow ABM system. This system was designed to intercept long range intercontinental ballistic missile attacks along with eight early warning radars and one Dunai-3U (dog house) battle management radar; having V-1000 interceptors at 32 launch sites around Moscow (O'Connor 2012). However, the experimental launch of the A-35 interceptor missiles made it clear that it would not be able to defend Soviet Union, against massive nuclear missile attacks equipped with Multiple Re-entry Vehicles (MIRVs) and defensive countermeasures (Gobarev 2001: 37). Because of this technological uncertainty, the A-35 system was upgraded by a new territorial (national) missile defence system known as the 'Aurora missile system' (Gobarev 2001: 38). Later on, one more upgraded ABM system known as 'Tallinn system'[20] was developed around the north-western parts of Russia near Leningrad (Kristensen, et al. 2004:70) which possessed significant capabilities both as a terminal defence and area defence (Kristensen et al. 2004:71).

In succeeding years, USSR (Russia) continues to concentrate on the maintenance and development of the Moscow ABM system which remain as first priority in its defence policy. In fact, at that time Moscow ABM was the only operational Soviet ABM system defending the Moscow region (Macdonald 1981:64). The A-35 (ABM-1) system became operational around Moscow between 1961-1978; which was followed by the A-35M (ABM-2) operationalised from 1978-1995 and the A-135 which was operationalised from 1995 (Obe 2011: 290). The original ballistic missile at Moscow (the A-35 system) included 64 GALOSH interceptors up to a range of 300 km, located at four different sites, with two large radars: dog house and cat house radars (Kristensen et al. 2004: 70-77). It was the world's first exo-

[19]The atmosphere below 120 Km altitude is called endo-atmospheric and interceptor designed for endo-atmospheric interception is called endo-atmospheric interceptor (Obe 2011: 289).
[20] The system of Tallinn consisted by three launch sites along with six S-A 5-B Gammon launchers and one pair radar, particularly designed to defend Russian against aircraft and ballistic missile attacks (Kristensen, et al. 2004:70-71).

atmospheric BMD system (Kumar 2008a:75). The A-35 system later on was replaced by upgraded A-35M and A-135 ABM systems. System A-35M was designed to intercept ICBMs employing ABM countermeasures such as jammers and decoys (O'Connor 2012). The present upgraded missile defence system at Moscow incorporates new fixed engagement radar, a high acceleration interceptor and a silo launcher along with a modified version of the exo-atmospheric interceptor of the original A-35 Moscow ABM system (CIA 1982:10). Like its predecessor (A-35 missile defence system), the upgraded ABM system known as A-135 was equipped with new 100 'gazelle interceptors'[21] (as allowed under the ABM Treaty) associated with two guidance radars and a new large radar at Pushkino (northeast of Moscow) designed particularly to defend Moscow against threats like the U.S. Submarine-Launched Ballistic Missile (SLBM) and Intercontinental Ballistic Missile (ICBM) attacks (Kristensen et al. 2004:73, OTA 1986:59). The Pushkino radar (the Pushkino radar which controls the whole ABM system), also known as Pill Box is approximately 152 meters long at the base and 76 meters high, four times larger than the U.S. Pave Paws radar (Yost 1988:37). The Gazelle interceptor (also known as SH-08) gave Moscow ABM system its first capability to employ atmosphere sorting to discriminate real warheads from countermeasures techniques such as penetration aids, lightweight decoys and chaff (Yost 1988:34). According to Obe (2011: 291) a further improved Moscow ABM system (ABM-4) has been deployed by the Russian federation and it is believed that the upgraded system would replace both A-30 (SH-08 Gazelle) and A-50 (SH-11) Gorgon interceptors from the existing Moscow ABM-3 system (Obe 2011: 291). The Gorgon system was developed in four sites around Moscow with eight silos each to engage incoming re-entry vehicles outside the atmosphere (Kristensen et al. 2004:74).

Besides these, Russian national air defence consists of an estimated 12,000 surface to air missiles of which three are potentially BMD capable systems: SA-5 (Gammon), SA-10 (Grumble) and SA-12 (Gladiator) [Davis 1980: 52; Yost:

[21] The galosh interceptors was designed to intercept the incoming enemy missile outside the atmosphere, silo-based high acceleration new modified galosh interceptors known as gazelle interceptor or SH-08 was designed to intercept the incoming enemy missile within the atmosphere (OTA 1986:59, Yost: 1988:34).

1988:39]. A surface to air, missile defence system, is designed by different radars to track and detect the target launched by the SAM site (Yost: 1988:62).

3.4.1.1 SA-5 GAMMON (S-200)

The SA-5 (Gammon) is a medium range (up to 60 km) ground based missile interceptor which carries solid and liquid propellant booster motors (Obe 2011:315). This system is also known as S-200 but some of the U.S. strategic analysts claim that the Soviet was repeatedly upgrading the SA-5 missile into an ABM system (Davis et.al 1980: 53). In fact, SA-5 was designed as dual-purpose SAM/ABMs (Lee 2000:147). It was an effective high-altitude air-defence interceptor guided by some suitable radar which gradually upgraded its capability against ballistic missiles having a range up to 300km (Yost 1988:39). SA-5 system was repeatedly modified by three versions: first system designated as a SA-5A carries conventional HE warheads; second known as SA-5B carries nuclear warheads and finally SA-5C which is upgraded in a terminal defence system carries the same warheads of SA-5A system (Obe 2011:315).

3.4.1.2 SA-10 GRUMBLE (S-300)

The SA-10 is a short range ship based surface- to- air missile defence system designed to destroy Air to Surface Missiles (ASMs) and surface to air missiles but it has also some additional capabilities to intercept short range ballistic missiles (Obe 2011:321). The System was first developed in 1960, by the Russian Scientific Production Association Almaz-Antey to shoot down low-altitude targets, including cruise and aircraft missiles but gradually different version of SA-10 missiles were developed to improve the efficacy of the existing system (Obe 2011:317, Missilethreat 2012). More recently, the Soviet has developed SA-10B mobile interceptor to counter the U.S. retaliatory forces (Yost: 1988:41).

3.4.1.3 SA-12 GLADIATOR (S-300V)

The Russian S-300V system is designed to intercept incoming cruise missiles and tactical ballistic missiles (Obe 2011:323). This system is also called ATBM system which has two more variants: Gladiator (SA-12A) and Giant (SA-12B). Compared to the first one the advance SA-12B system possesses greater capability as it is able to intercept strategic ballistic missiles also (Yost 1988:42). However, the development of a new interceptor known as Triumfator-M (S-500) is now claimed to be in the design stage (Tsypkin 2012 56). According to Obe (2011:330) the new SA-500 missile has a range of 600 km and is similar in performance to the U.S. THAAD and SM-3 system and both are supposed to be designed as a land-based and sea-based defence system having additional capabilities against high-flying aircraft.

3.5 CHINA'S BALLISTIC MISSILE DEFENCE SYSTEMS

Continued exploration and deployment of BMD systems by the United States and former Soviet Union have intensified the Chinese interest in missile development (Gansler 2010:8, Lewis and Di 1992:5). Today, China is one of the five nuclear powers states in the world, possessing large missile arsenals (Kumar 2009b: 38)[22]. The journey of China's missile programme started in 1950 when it acquired its first ballistic missiles—R-1s and a single R-2 missile from the Soviet Union and set the stage for developing its own missiles based on Soviet designs (Riper 2004:92). Mao Zedong, Chairman of the Central Committee of the Communist party of China, in 1964, declared that China would start a long-term ballistic missile research programme (Roberts 2003:7) and, by the end of the year, China's People's Liberation Army (PLA) developed two types of long-term ballistic missiles: one Intermediate-Range Ballistic Missile having a range of up to 3,000 to 4,800 (IRBM) and other ICBM having range up to 8,000 (Lewis and Di 1992:6). Later on, in 1980, China developed and tested its first missile armed with nuclear weapons capable of delivering warhead to the continental United States. In succeeding years China also successfully demonstrated its first submerged test launch of the JL-1 SRBM (Christensen 2012: 455) and soon the number and the capability of Chinese SRBMs have increased up to about thousand (Ganesh 2012: 315).

Though China's security policy is largely dominated by offensive strategy but at the same time China also recognised the importance of missile defence capabilities which is confirmed by the words of Mao - "*missile defence capability should not be dominated by the two superpowers only, China must also develop its own missile*

[22] Today there are more than five nuclear-weapon states in the world but Russia former Soviet Union, UK, USA , China and France are officially recognized nuclear weapons states by the Nuclear Non-Proliferation Treaty (NPT) (Bosch 1995:24)

defence weapons, no matter how long it would take (Sinodefence 2009:1) [Originally not in italic].” Under this approach, soon Mao ordered to start the creation of a strategic force capable of taking care of both offence and defence missiles (Ganesh 2012: 326) and to materialize his vision, Project 640 was launched by China to develop ABM system for Beijing (Obe 2011: 229). The main aim of the Project 640 was to developed FanJi (Counterattack) ABM, the XianFeng (Pioneer) anti-missile super gun, and a ground-based early warning radar (Sinodefence 2009). Subsequently Project 640 had developed three variants of FanJi ABM: FanJi 1, FanJi 2 and FanJi 3. It was the modified technology of FanJi 1 system, on the basis of which China formed more advanced FanJi 2 and FanJi 3 systems. According to Obe two FanJi missiles were tested in 1975 and five FanJi 2 missiles similar in performance to the U.S. Sprint interceptor were tested in 1976 and 1985 while FanJi 3 is yet not tested (Obe 2011: 229). While FanJi 1 and FanJi 2 systems were designed to intercept ballistic missile warheads at low- to medium-altitude, FanJi 3 is designed to intercept high-altitude ballistic missiles (Sinodefence 2009). It is believed that these interceptors were able to carry nuclear warheads along with both liquid and solid propellant booster motors (Obe 2011: 229, Sinodefence 2009).

However, in recent year American withdrawal from the ABM Treaty has increased China’s concern about its missile defence and as a response to changing global order, in 2003, China initiated a new ABM programme known as ‘Project 863’ for developing more advanced interceptors to destroy both IRBM and ICBMs (Obe 2011: 229). Further, in 2004, China also purchased 120 S-300P interceptor systems from Russia and with its help soon produced its own versions: ‘HQ9, HQ10 and HQ15 systems’[23] (Ganesh 2012: 326). The HQ-9 SAM defence system is designed to defend China against long rang surface to air missile with a range up to 90 km and 27 km altitude (Kumar 2010c: 5). This system is similar in performance to the U.S. PAC-3 and Russian S-300P interceptors (Kumar 2010c: 5). Besides these, China is also increasingly developing various Anti-ship Ballistic Missiles (ASBM) as in august 2010, Admiral Robert F. Willard, the Commander of the U.S. Pacific Command, reported that China had successfully tested a land- based ABM known as Dong Feng-

[23] There is a series of Hongqi (HQ) indigenous air-defence systems in Chinese inventory, namely: HQ-1, 2, 9, 10, 12, 15, and 16 - being developed and deployed at various stages, having applicability ranging from surface-to-air defence to theatre defense (Kumar 2010c :4).

21D, which is the world's first long range, land based carrier killer ASBM reaching to Initially Operational Capability (IOC) [The Military Balance 2011:198, Collins and Erickson 2010:2].

3.6 INDIA'S BALLISTIC MISSILE DEFENCE SYSTEM

Like China, India is also developing its own indigenous missile defence system. India successfully conducted its BMD test in 2007 (Kumar 2009b: 48). Indian BMD systems include AAD, the Prithvi series of Surface-to-Surface Missiles (SSM), the Nag Anti-Tank Guided Weapon (ATGW) and the Akash (SAM) [Sahni 2004:90]. As part of this programme India is also developing the Sagarika (SLCM), the Dhanush and Brahmos (SLBM), the Astra Surface to Air- Anti Missile (SAAM), Surya (ICBM) and the Trishul (SAM) (Sahni 2004:90 Kumar 2009b: 46).

3.6.1 DEVELOPMENT OF ADVANCE AIR DEFENCE (AAD) SYSTEM AND PRITHVI AIR DEFENCE (PAD) SYSTEM

The year 1990 marked the beginning of India's missile defence programme. In the beginning, India started to developed two types of interceptors – the first one known as PAD or Pradyumna ballistic missile for high altitude interception and the other one is known as AAD missile for lower altitude interception (Jaspal 2011a:8). Accordingly, two separate projects were launched namely- 'Project Ashwin' to develop AAD missile and 'Project Pradyumna' for PAD development (Obe 2011: 249). The overall co-ordination and direction of both projects is carried out under patronage of the Indian Defence Research and Development Organization (DRDO) founded in 1958 (Topychkanov 2012:19).

3.6.1.1 DESCRIPTION OF AAD INTERCEPTOR

AAD is an endo-atmospheric (intercepting targets within atmosphere), lower-tier ballistic missile interceptor designed to intercept cruise and aircraft missiles (Obe 2011: 249-250). This system have a range up to 30 km by which it could accelerate the boost phase up to 1.0 km and intercept the target at an altitude of up to 30 km (Topychkanov 2012: 19). One important feature of this system is that it has the capability to carry out multiple fragmented warheads along with a single stage Hydroxyl-Terminated Polybutadien (HTPB) based solid propellant rocket motor

(O'Halloran and Foss 2010:156). On December 6, 2007, India successfully conducted its first AAD interceptor test from Wheeler Island to destroy a Prithvi Surface-to-Surface missile fired from the Chandipur, Orissa (Jaspal 2011a:8). The system intercepted the target missile at an altitude of 15 km (Topychkanov 2012:19). Recently, on November 23, 2012, DRDO has conducted eighth AAD interceptor test from the Wheeler Island and successfully intercepted the attacker missile in endo-atmosphere at an altitude of 15 km to 16 km (Subramanian 2012).

3.6.1.2 DESCRIPTION OF PAD INTERCEPTOR

PAD system is designed to intercept the target missile outside the atmosphere hence labelled as an exo-atmospheric interceptor. This system falls under the category of an upper-tier air defence system with a range of up to 250 km (Obe 2011: 251). The PAD has two types of fuelled missile interceptors; each designed to hit a target within four minutes (Kumar 2008a:183). The first one consists of liquid-fuel, while the second one is equipped with solid-fuel (Topychkanov 2012: 21). It is believed that the PAD has formed the basis of a new Prithvi missile interceptor known as Prithvi Developed Version (PDV) [Obe 2011: 249]. The upgraded PDV uses solid propellant rocket motor and is a two stage missile system accompanied with a new guided technological system which controls the missile at an altitude of more than 150 km (O'Halloran and Foss 2010 :156). Over a period of time, three different versions of Prithvi missile interceptor were developed: Prithvi I, Prithvi II, Prithvi III (Mian et al 1998: 334). Prithvi I has range up to 1,000 km and is able to carry a payload of 1,000 kg whereas Prithvi II has a range up to 250 km and is capable of caring a payload of 500 kg. The third version of Prithvi interceptor (Prithvi III) has a maximum range up to 350 km and is reported to be under development (Mian et al 1998: 334-335).

The Prithvi is able to carry a nuclear warhead along with multiple warheads including unitary high explosive, pre-fragmented; mine lets and cluster munitions (McCarthy 1994:207). The first flight test of Prithvi was conducted on February 25, 1988 (Mian et al 1998: 334-335). The first Prithvi test on HE based warhead was conducted in 1990 at Pokharan, Rajasthan (McCarthy 1994:207). Since then, several test of Prithvi have been conducted to demonstrate the feasibility of the system.

Recently, the successful test of Dhanush missile (the third variant of the Prithvi) with range of 350 km was conducted on December 14, 2009 (NTI 2012).

3.6.2 AKASH SURFACE-TO-AIR MISSILE (SAM)

Akash is a medium range SAM, specially designed to provide multi-directional and multi- target air defence (O'Halloran and Foss 2010:153). This system "is ideal for point, area defence and limited theatre defence, could operate well in conjunction with the high-resolution, fire-control phased array radar known as Rajendra (Kumar 2008a:181)." The effective Rajendra radar enables Akash to track up to 64 targets at a range of 50 km (Jaspal 2001b:47). An important feature of Akash is that it uses a solid propellant ramjet rocket propulsion system which gives it a low-volume, low-weight (700 kg at launch) missile configuration along with the ability to respond quickly, within 15 seconds (Srivastava 2000: 325). It aims to replace the Russian kub (SA-6 Ganinful) SAM system and possibly operate both as a sea-based and ground based defence system (Obe 2011: 251). In an integrated air defence environment, the Akash has a range up to 27 km with heavy payload capacity of up to 60 kg (Kumar 2008a:181; Dhanda 2010: 268). It was in 1990, that the first flight test of Akash was conducted and after a long period in 2006 the evolution process of the system was completed by Indian Air Force (Obe 2011:251). Recently India was planning to deploy six divisions of Akash missile in the north-eastern region of India to counter the potential air threat from China (NTI 2012). In addition, DRDO is repeatedly upgrading the range of Akash system up to 40-60 km to counter IRBM threats (Srivastava 2000: 325-326). Recently, the U.S. cleared Indian desire of purchasing its aided Arrow missile defence of Israel as it sees India as a 'lynchpin' in his strategic move called 'Asia Pivot'(Sahgal 2012, Mohan 2012: 1). In fact, this move is considered as part of the U.S. policy to balance its traditional non allies in Asia (Russia, China, India) by preventing their combination to undercut its geopolitical interests (Tellis 2006:150). Accordingly, India got an opportunity to access the western BMD market. There are also reports that India is trying to use Arrow missile technology purchased from Israel to upgrade Akash into an ATBM (Hilali 2001:753). Indeed, India has started to develop the Airborne Early Warning (AEW) platform along with PAR technology to materialise her vision of developing Arrow ATBM system (Koblentz 1997:54).

3.7 ISRAELI BALLISTIC MISSILE DEFENCE SYSTEM

Since the very inception of Israel, it found itself surrounded by hostile Arab neighbours with whom it fought several wars. In fact, Middle-East is one of the most volatile areas of world which generated several occasions for superpower confrontations in the past also (Hofung 1996:290). The scale of the missile threat facing Israel is well documented in the 1991 Gulf War when Iran launched a ballistic missile attack against Israel and Saudi Arabia (Spierco 2010:128 Gansler 2010:1). Keeping in mind, the nature and severity of threats to its population and nationhood, Israel is attempting to develop a robust missile defence under two tier systems – Iron Dome Missile defence and Arrow missile defence.

3.7.1 IRON DOME OR IRON CAP MISSILE DEFENCE SYSTEM

Iron dome missile is designed to intercept very close threats like rocket fires from neighbouring states, Short- Range Ballistic Missile attacks (SRBM) and cruise missiles attacks armed with Unmanned Aerial Vehicles (UAV) [Obe 2011:281]. This system is placed in southern and northern part of the country particularly to defend Israel against rocket attacks by Hamas and Hizbullah (O'Halloran and Foss 2010:175). It is believed that the Iron Dome missile with range up to 18 km would be able to intercept a target between 2.5 and 45 miles (Sharp 2012:10, Obe 2011:281). This system is developed by Rafael Advanced Defence Systems Ltd. and became operational by 2010-11 (Obe 2011:282). The interceptor used under this system is called Tamir interceptor having a length of around 3.0 meters and a diameter of 0.16 meters (Obe 2011:281). Since its active deployment in 2011, "Iron Dome batteries have intercepted over 90 Qassam and Grad rockets fired into Israel from the Gaza Strip (Harmer 2012:8)." This system was found to be very successful in preventing causalities during Israel's war with Hamas in November 2012 (Shanker 2012: 1) and as a result the Israeli military is planning to deploy "nine more Iron Dome batteries across the country by 2013 (sharp 2012: 11)." Each Iron dome battery operates in conjunction with three components that manage the entire function of the system: a radar detection unit, a battle management centre and a missile fire control centre (Lipin 2012). The system uses early warning radar known as C41 radar to track multiple targets and to identify SRBM and rockets during its flight trajectory (O'Halloran and Foss 2010:175). The function of a battle management centre is to determine the location of incoming rockets and it is on the basis of this determination, that missile firing unit would launch the interceptor missile to destroy incoming rockets (Lipin 2012). Moreover Iron dome battery consists of three mobile missiles launchers each carrying 20 interceptors (O'Halloran and Foss 2010: 175).

3.7.2 ARROW MISSILE DEFENCE SYSTEM

The Arrow is an ATBM system prepared to counter the major threats from strong and nuclear power seeking rivals of Israel like "Iran which threats to wipe off Israel from world map (Torbati 2012)." The system is designed as a medium range missile interceptor to provide Israel the capability of TMD against ballistic and cruise missiles (AICE 2012). It is claimed to "defeat the largest, longest-range, and fastest missile threats including shahab-3, shahab-4, and sejil missiles (Harmer 2012:7)." Arrow is a combined missile defence program developed by Israel in collaboration with the United States. It is well thought-out by the American Israel Public Affairs Committee (AIPAC) that the project is a centrepiece of the U.S.-Israeli strategic cooperation (Clarke 1994:475). In fact, half of the annual expenses of the development of the Arrow Weapon System are funded by the United States (Sharp 2012:13).

Even though, the developmental works on Arrow began much before 1988, when Ronald Reagan launched his visionary Strategic Defense Initiative (SDI) programme in 1983 which developed Israel's interest to develop its own Arrow BMD shield, the first significant development work on Arrow began in 1988 when a Memorandum of Understanding (MOU) was signed between the U.S. and Israel Aircraft Industries Ltd. (IAI) for the Project Home wall to defend Israel against all sorts of missile attacks (Ahlstrom 2004:112, Obe 2011:274). Subsequently the project Home wall had formed the basis of three different variants of Arrow: 'Arrow 1-technology demonstrator, Arrow 2 - initial operational variant' (Harmer 2012:7) and Arrow 3- under developing process.

3.7.2.1 ARROW 1

The original version, known as Arrow-1, is a two-stage solid propellant missile interceptor with high explosive warhead that has a top speed of Mach 9 (Harmer 2012:7, Obe 2011:275). It has a range up to 50 km (Obe 2011:275). The missile system has a terminal IR focal plane array radar along with an associated inertial and command update mid-course guidance system, particularly designed to intercept ballistic and cruise missiles (AICE 2012, Obe 2011:275). In the year 2000, the system was successfully tested and reached its initial operational capability (Sharp 2012:13).

3.7.2.2 ARROW 2

The Arrow 2 is an upper-tier endo-atmospheric missile interceptor particularly designed to intercept targets within the atmosphere (Kumar 2008a:174). In contrast to Arrow 1, the upgraded Arrow 2 has greater range approximately about 100 Km (Obe 2011:276). The system is also able to intercept targets at an altitude between 40 and 100 km (Ahlstrom 2004:113). In this system "the interceptor contains a blast fragmentation warhead to eliminate incoming missiles (Missile Defense Agency 2007)." Like its predecessor, the upgraded Arrow 2 missile has two solid propellant stages. The first solid propellant stage consists of a booster and the second one consists of sustainers (Ahlstrom 2004:112). One important feature of this system is that it uses two types of surveillance radars: the Green Pine and block B Super Green Pine radars (Obe 2011:276). The Green Pine radar is able to detect and track targets at a distance of over 500 km while block B Super Green Pine radars are more advanced in terms of detecting and tracking targets (Kumar 2008a: 173) with an ability to detect targets at a distance of over 800 km (Obe 2011:276). In addition, Arrow 2 also has an effective fire-control centre called Citron Tree fire-control centre which could launch a high-altitude, hypersonic Arrow interceptor missile to neutralize the threat (Siperco 2010:130-131). The first launch test of Arrow 2 missile was conducted in 1995 and by 2000, eight Arrow 2 launch tests have been conducted successfully (O'Halloran and Foss 2010:379).

3.7.2.3 ARROW 3

The Arrow 3 is a top-tier missile defence system designed to intercept long-range conventional ballistic missiles (AICE 2012, Sharp 2012:14). It is reported that the upgraded Arrow 3 has obtained the elements of the U.S. PAC-3 interceptor to operate in a two-tier system (O'Halloran and Foss 2010:380). The system is developed with range of 15, 00 to 2,500; having more capability as compared to the Arrow 2 system (Obe 2011:277). This system is designed as an exo-atmospheric interceptor to directly target an incoming missile outside of the earth's atmosphere (AICE 2012). The main purpose of upgrading the Arrow 3 missile defence system is to increase the capability of Arrow to intercept the missile in space (O'Halloran and Foss 2010:380). It is expected that Arrow 3 system would be deployed for military purpose by the year 2014 (Sharp 2012:14). In addition to these, Israel is also developing a medium-range and short-range missile defence systems under the system called David's Sling which is primarily intended to destroy the Katyusha, Qassam and other cruder rockets launched from southern Lebanon and the Gaza (Yom 2008:28). The David's Sling is a two-stage solid propellant interceptor, it would have a range of up to 300 km primarily designed to replace the PATRIOT missile system (Harmer 2012:8). India is continuously trying to upgrade its Arrow 3 in line of such advancements.

3.8 SUMMARY

The popular reason quoted for development of ABM is the rising threat of ballistic missiles due to increased technology in offensive war and its extension to several numbers of rising powers. The technological extension made the U.S. prone to the serious threats and changed its direction to also strengthen the defensive mechanism and finally its move acted as catalyst to other countries desirous either to compete with USA or to ensure a better protection against potential hostile states and groups. In this chapter, as discussed above, we have analysed some of the major BMD systems developed by prominent countries like the United States, Russia, China, Israel and India. Specifically, the chapter also elucidated the technological aspects of BMD systems and gave lucid architecture of these systems. In nutshell, the chapter can be summarized with following outcomes:

Though all BMD systems are designed to deal with missile threats, they differ with regard to the quality of interception and discrimination of incoming threats because of multiple factors including varying nature of sensors or interceptors used which again results in differences to the ranges of interception and accuracy of tracking incoming targets (Weiner 1984: 97). Further, since each BMD system is designed to deal with particular kinds of threats, the architecture of one BMD system differs from other BMD system (Rance 2001:36). For instance, the United States has developed AEGIS BMD system against SAM threats and THAAD system is designed against tactical and TBM threats, so both are fundamentally different in purposes and hence their design differs with regard to speed, range and target altitude. Another irony of BMD is its guarantee of protection, in a time, when technology is not the monopoly of certain powerful states and most of states are either busy with the continuous modification of their existing BMD system or aspiring to achieve it. For example, the world has witnessed over past two decades the increasing proliferation of defensive technologies including that of BMD across the globe. The emerged security dilemma can be simplified as follows - when the U.S. is developing NMD system, Russia is repeatedly upgrading its Moscow ABM system. Again the BMD system is seen as new instruments of bringing hostilities at doors with its extension from these two powerful old rivals (the U.S. and Soviet Union) to other countries. For example China is working on its Fan Ji ABM system and Moscow is actively transferring its interceptor technology to China for its effective BMD systems. At the same time, USA is also transferring its BMD technologies to its older allies of NATO members like Israel which generated the interest of acquiring such technology by other states like India and the U.S., it cleared the transfer of its assisted Arrow technology of Israel to India for its recent emerging closeness (Ahlstrom 2004:117) where both countries believe to get a lot by working together in area of security. In this context we can say that proliferation of ballistic missile systems by some countries has intensified global interest in missile defence.

CHAPTER 4

IMPACT OF BALLISTIC MISSILE DEFENCE ON NUCLEAR DETERRENCE

> A shift to a strategic environment where defences are dominant, can provide substantial homeland protection, but would upset and overturn deterrence stability based on the mutual vulnerability of the superpower and the threat of nuclear retaliation (Soofer1988:48).

4.1 INTRODUCTION

The above quoted statement by Soofer reflects that there is a strong casual relationship between the strategy of nuclear deterrence and ballistic missile defence. On one hand, whereas the defences can strengthen deterrence by increasing uncertainties about the putative advantages of attacking first (Brams and Kilgour 1988:4); on the other hand, defences can also weaken the strategy of nuclear deterrence by reducing the threat of a retaliatory counterattack to deter the ‘first strike’[24] (Brams and Kilgour 1988:4). The appearance of this strategic environment generated the possibility in terms of Aaron Karp ‘the new indeterminacy of deterrence and defence (Karp 2006: 63)’, wherein the deterrence and defence are not only stand as the traditional polar opposites of each other, but might also be incompatible under certain circumstances (Rajagopalan 2004a:205). The intricacy of this strategic environment incorporating deterrence and defence holds a great controversy over security in this contemporary world order.

While there has been a significant controversy over the development of missile defences; changes in the strategic environment, the spread of nuclear weapons and ballistic missile technologies has changed the requirements of nuclear deterrence (Futter 2011b:254). Retaliation is considered as one of the basic foundation of deterrence, however with changing nature of threats from rouge groups like terrorists organisations who have no land, no identity; no clear structure of responsibility

[24] In general, a first-strike capability means ‘the ability to launch a pre-emptive attack’ against an enemy (Lodal 2001). According to Kumar (2008:71), a country will carry out a nuclear first strike only if it is capable of defeating another nuclear power by destroying its arsenal to the point where the attacking country could survive weak retaliatory capability. However, the concept of pre-emptive attack as practiced by the George W. Bush administration is largely considered as preventive war (Preble 2005:27). Preventive attack, in contrast to the pre-emptive attack, aims to prevent the potential enemy threat by destroying it before the attack is launched (Rajagopalan 2005:186).

brought the retaliation concept under widespread criticism these days. In a time, when we are witnessing the failure of traditional deterrence; the "missile defense as a means of deterrence by denial is capturing the spotlight amid new mounting threats (Shinichi 2004: 104)." This concept focuses on preventing the first strike attack by such 'rouge states'[25] and groups. It has, therefore, acknowledged that the defence is inextricably linked to the credibility of nuclear deterrence in an era where the requirements of deterrence are fluid and nuanced (Futter 2011b:254). In other words, the deterrence and defence are not the traditional polar opposites of each other but might in fact intertwined with each other under certain circumstances where it can play important role in security (Rajagopalan 2004a : 205).

Because of this interplay between deterrence and defence, on one hand whereas there is concern for development of Ballistic Missile Defence (BMD); on the other hand it has also pushed the armed race. The opponents of BMD system have argued that the spread of ballistic missiles technology would not only 'revive the cold war rivalry (Kumar 2008d: 70) of old superpowers, but also garner the severe new tensions with small nuclear powers. While the first part of the debate about the consequences of BMD has focused on its impact on traditional nuclear deterrence; the second part of the debate attempts to cover the revival of nuclear deterrence at global and regional level. This enlargement in scope has become imperative because of the recent proliferation of ballistic missiles by several small states as BMD has no longer remained the prerogative of big powers. These debates have allowed for comparison and evaluation of the concert manifestations of the consequence of defence on deterrence over time and the manner in which they have been combined with proliferation of ballistic missiles (Peoples 2010:4).

[25] A major disagreement exists with regard to the definition of a rouge state. While many scholars define the concept of a rogue state as an undeterrable state but the key problem is that how to identify these rouge states (Dellit and Lyon 2010:446). Rouge states as defined by the National Security Strategy of the United States of America "are those states who brutalize their own people and squander their national resources for the personal gain of the rulers; display no regard for international law, threaten their neighbours, and callously violate international treaties to which they are party; are determined to acquire weapons of mass destruction, along with other advanced military technology, to be used as threats or offensively to achieve the aggressive designs of these regimes; sponsor terrorism around the globe; and reject basic human values" The National Security Strategy of the United States of America 2002: 13-14, [Online: web] Accessed 8 October 2012 URL http://www.globalsecurity.org/military/library/policy/national/nss-020920.pdf .

The purpose of this chapter is not to analyse deterrence and defence for its content but rather try to find out the intricacies that lead to the indeterminacy of deterrence and defence. It is in this regard that three sections attempt to explain this puzzling issue:

At first, particular attention is paid to the concept of deterrence. By doing this we will compare and contrast the traditional concept of retaliatory deterrence and the modern concept of defensive deterrence. However, to understand this trajectory, one cannot ignore the termination of the Cold War and the proliferation of ballistic missiles that are somehow closely linked to the concept of deterrence and more importantly responsible for the changing nature of nuclear retaliation. Hence, this section will also attempt to bring forth these important changes in terms of the perception of threats and attempt to show how it led to the urgency of defensive deterrence.

Second section will analyses the extremely important reasons for incompatibility between missile defence and nuclear deterrence. It does so, by assessing the impact of ballistic missile defence on three different areas and how it influenced directly or indirectly strategic circumstances established by the strategy of nuclear deterrence on one hand and undermined its creditability of mutual vulnerability on the other hand. An effort will also be made to draw the consequences of ballistic missile defence on small nuclear states to assess the extent to which the spread of missile technology has posed the threat of deterrence in various parts of world.

Lastly, this chapter will focus on the extremely important role that the ballistic missile defence played in complementing deterrence in the 21st century. The main purpose of this section is to find out the compatibility between missile defence and deterrence.

Hence, in a nutshell this chapter will not focus on the details of the failure of missile defence instead it will try to understand what made that compatibility of defence and deterrence possible, even as there exist equally important reasons for incompatibility.

4.2 BACKGROUND

"Throughout its history, ballistic missile defense has considered as a destabilizing element (Schin 1996:1)". In fact, in 1972 the Anti-Ballistic Missile (ABM) Treaty was signed by the United States and Soviet Union, which imposed mutual restriction on both countries to develop ballistic missile defence systems and firmly established the strategy of retaliatory deterrence based on the forces of offensive capabilities. Since then the nuclear deterrence have been seen as "the key to ensure security and the ultimate way to deter aggression (Futter 2012c:1)." Although, deterrence is the central concept for the strategic stability but the meaning and concept of the word deterrence is changing constantly because of a number of contemporary issues have placed increasing limits on the exercise of the credibility of the deterrence. After the terrorist attacks of 11 September 2001, the applicability of traditional deterrence strategy in the post-cold war era came under widespread criticisms (Barkley 2008:456). These factors have raised questions about the fixity of the concept of nuclear deterrence often assumed by nuclear strategists. Moreover, the rise of ballistic missile defence armed with weapon of mass destruction has framed a new debate by presenting missile defence as a break from traditional deterrence principles (Lebovic 2002:455). Because many believe that such a defensive posture will lead to a new development of missiles and destabilized strategic stability. "It is in the context of instabilities caused by BMD, the concept of deterrence is gradually losing credibility (Soofer 1988:4)." In fact, missile defence has sparked the fear of what many scholars called a new Cold War by destabilising the stable relationship between the U.S. and Russia (People 2010:1). More recently, American plan of BMD programme has also enlarged the debate over missile defence and its potential impact on the nuclear deterrence of the transatlantic relationship such as china.

However, the recent withdraw from the ABM treaty by the President Bush has caused more to destabilised the strategy of nuclear deterrence. Since efforts to maintain credibility of nuclear deterrence is intertwined with the U.S. and Soviet mutually agreed arms control negotiation, the withdrawal from ABM treaty must be contribute to jeopardised deterrence stability and undermine international efforts to aims at arms control (Levine 2001:29, Russell 2002:494).

Although missile defence is viewed as destabilising in the context of nuclear deterrence but behind this argument usually lays a set of assumptions about the roles of missile defence in complementing deterrence (Sloss 1984:24). The end of the Cold War and the success of the U.S. advanced BMD system in the Gulf War have led to a renewed interest in assessing the effectiveness of missile defence as a deterrence. Since the last two decades the role of missile defence in strengthening regional deterrence has increasing significantly (Thomson 1998:2). Hence, in this context one can say that ballistic missile defence has both positive and negative aspects.

4.3 CONCEPTUAL ANALYSIS OF THE CONCEPT OF DETERRENCE

Deterrence is the central phenomenon in ensuring security though strategic stability. Several scholars have tried to define this concept from different perspectives. Mark Damian Rix defined deterrence as a strategy by which one country sought to prevent another country's pre-emptive nuclear attack by the threat of destructive retaliatory capability (Rix 1997:1). C. Raja Mohan defined deterrence as a kind of relationship in which country 'A' influenced the behaviour of 'B' not by the threat of sanction or deprivation but by the threat of unacceptable costs upon B in the event if he takes the action (Mohan 1986a:4). More recently Robert P. Haffa, Jr. defined deterrence as "the prevention from action by fear of the consequences (Haffa et al; 2009:3)**."** However, the central idea of all these definition lies in the fact that it "intends to convince a potential aggressor not to undertake a particular action because the costs will be unacceptable or the probability of success extremely low (Gerson 2009:34)." In nutshell, it poses threat to prevent aggressive actions.

However, there is no single type of deterrence and in order to set the parameters of what is discuss in this chapter it is necessary to give a brief overview of different types of deterrence. By and large there are two types of deterrence. One tries to prevent the aggression by increasing the threat of retaliation and other attempts to prevent the aggression by increasing effective defence against such aggression. Both of this in totality is considered as deterrence whose primary function is to deter the aggression. However, the ways in which they perform their functions differ significantly.

Some scholars and nuclear strategists also classify deterrence under category of nuclear deterrence and 'conventional deterrence'[26]. The former is defined as deterrence by the threat of punishment; while the latter is based on deterrence by denial which primarily aims to prevent an adversary from achieving its objectives through a strategy of 'fait accompli'.[27]

4.4 NUCLEAR RETALIATION WITH THE STRATEGY OF DETERRENCE

Deterrence strategy is normally based on promise of retaliatory action or the threat of punishment, if the concerned potential entity whether state or collective group is attacked either by conventional or nuclear weapons (Hynek 2010: 436). The strategy is, therefore, founded on the belief that the outcomes of a first attack would led to unacceptable devastating damage for a potential adversary and thus ensures no attack in the first place. As Rajagopalan (2005:21) observes, retaliatory deterrence seeks to prevent aggression by threatening unacceptable damage in retaliation or by the threat of punishment. The main logic behind this strategy is that if both the party in a conflict maintained the capability of second strike after being attacked, neither side would engage in aggressive behaviour because vulnerability came to be seen as destructive for both the sides (Soofer 1988:45). Thus, the strategy of mutual vulnerability and assured destruction is comprehensively linked to the strategy of nuclear retaliation. The importance of these strategies lies in the fact that they ensure the credibility of the threat of retaliation by making clear the causality about the means and ends (Rajagopalan 2005:22).

However, the primacy of deterrence by retaliation goes back to the earliest days of the Cold War and deliberations over strategic containment of the Soviet Union with the U.S. President Richard Nixon (Haffa et al. 2009:3). 'After a decade of diplomatic wrangling', the strategy of deterrence by retaliation was achieved on May

[26] A major discrepancy exists with regard to the use of conventional deterrence and nuclear deterrence. According Rajagopalan (2005:18) the presence of nuclear deterrence makes war less preferable because states will afraid before pushing victory in war, the closer they come to victory, the greater the risk of nuclear retaliation. However, the presence of conventional weapons makes the war as the bedrock of victory because in conventional war lower the risk of annihilation, just exist limited concern for losing or winning the war (Gerson 2009:37, Rajagopalan 2005:19)

[27] The strategy of 'fait accompli' is largely used by the potential adversary in order to achieve its objective as quickly as possible. As Thompson (1998:56) observes that, by possessing the strategy of fait accompli the adversary can attempt to strike quickly and violently to achieve victory or substantial advantage, before the defender is able to mobilize and deploy sufficient retaliatory power.

26, 1972, when the U.S President Richard Nixon and the Secretary of former Soviet Union, Leonid Brezhnev signed a negotiation treaty, popularly known as ABM Treaty (Frye 1996:96). The net effect of this treaty on the strategy of nuclear deterrence was summarised by Soofer in the following lines:

> The ABM treaty eliminated the option of a full-scale development of defensive system and thus, enhances the strategy of nuclear deterrence through the clear recognition of mutual vulnerability (Soofer 1988:46)

4.5 DETERRENCE BY DENIAL WITH REGARD TO STRATEGIC BALLISTIC MISSILE DEFENCE (BMD)

"Deterrence works on the enemy's intentions, while defense reduces his capabilities (Haffa et al. 2009:4)" [Originally not in italic].

'Deterrence associated with ballistic missile defence is defensive deterrence or deterrence by denial', because the strategy of BMD to deter, is often assumed as synonymous with the strategy of deterrence by denial (Thompson: 1998:47). Both of them attempt to prevent an adversary from achieving its objectives through the measures that are truly defensive. In this context, the deterrent effect would achieve largely by convincing the aggressor that the strength of opponents "defensive capabilities are such that any attempts to achieve offensive objectives would be denied (Thompson 1998:47, Gerson 2009:37)." Contrary to the strategy of 'deterrence by punishment'[28], the 'deterrence by denial'[29] affirms the importance of nuclear and non-nuclear forces– including conventional weapons for maintaining a credible deterrence capability. As Thompson (1998:49) points out the inherent threat of offensive punishment associated with defensive deterrence against a conventional missile attack can only consist of conventional weapons because nuclear response to a conventional attack is not acceptable.

4.6 THE CHANGING NATURE OF NUCLEAR DETERRENCE

In the era of second nuclear age, nuclear deterrence both as a policy and a concept underwent something of a reincarnation. The strategic standoff, known as

---

[28] Deterrence by punishment gives emphasis on the offensive nuclear forces. As a result deterrence by punishment is assumed to be offensive in nature (Harvey 1997:1)

[29] "While all forms of deterrence aim to affect the aggressor's intent, punishment and retaliation strategies aim to achieve this effect directly whereas denial strategies aim to achieve the effect indirectly by defeating capability (Harvey 1997:15)."

nuclear deterrence, once institutionalized by the ABM Treaty has been overtaken by the advancement of new technologies with the demise of the Soviet Union (Schaffer, 2012:260). Following the success of the PATRIOT ATBM interceptor in Operation Desert Storm, the former U.S. Secretary of Defense, William Perry commented that this new military capability armed with ballistic missile defence system adds a powerful dimension to the ability of the United States to deter war (Gerson 2009: 35). The use of such defensive deterrence strategy in 1991 Gulf War was almost universally regarded as having changed the nature of nuclear deterrence and of the mechanisms for preventing war (Kenyon and Simpson 2006:7). The successful use of the U.S. BMD in Gulf War gave way to the split of deterrence in traditional deterrence used against strategic competitors such as Russia and China and modern deterrence to deal with undeterrable states and non state actors (Futter 2012c:1). This shift from traditional to modern deterrence had far reaching implications in the policy of nuclear deterrence as it lead to a complete departure of the deterrence in terms of Cold War perspectives and most importantly it also ensured that defence and deterrence are indispensible for global security order. In fact, this shift has been recognised by many scholars as the first significant transformation in contemporary security policy since the end of Cold War (Wirtz & Russell 2006:82).

There are several factors which were responsible for the transformation of the concept of deterrence in an era of second nuclear age, as Karp (2006:63) observes it is the changing nature of global threats and the credibility of retaliation that has undermined the overwhelming salience of deterrence. Over the last two decades, due to the significant advancements in ballistic missile technology and their growing proliferation by small states, nuclear retaliation as a principal strategy of deterrence is considered to be approaching obsolescence (Schaffer 2012:260). In this new strategic environment, Admiral Richard Mies, the former Commander-in-Chief of the U.S. Strategic Command while observing the puzzle comments:

> Deterrence based on the concept of retaliation alone won't suffice in this unpredictable, multi-polar world… How do you deter a non-state actor who has no return address? … How do you deter or dissuade someone whose reward is in the after-life (Durr 2002:13).

Responding to Admiral Richard Mies's doubts about the strategy of nuclear deterrence, the U.S. aggressively moved forward to redefine the nature of nuclear deterrence (Durr 2002:1). Although this change began under President Ronald

Reagan's strategic defense initiative (SDI) programme, it was expanded by President George W. Bush Junior, when his quest for a more flexible nuclear deterrence strategy was sanctioned under Nuclear Posture Review in 2001 (Futter 2012c:1). The Nuclear Posture Review (NPR) introduced for the first time the concept of global deterrence articulated in form of a new strategic triad (Paulson 2009:13). This new triad brings important changes in terms of the threat perception posed by the big nuclear states and threat posed by smaller nuclear states or "non-state actors armed with rudimentary nuclear, biological and criminal capabilities (Karp 2006:83)." It has, thus, firmly recognised that a smaller nuclear arsenal was desired to counter new or emerging threats, and to greatly reduce or eliminate civilian casualties which can be accomplished only through the development of weapons with more tailored and precise effects (Paulson 2009:13-14).

Accordingly, the new triad has suggested a more flexible deterrence framework consisting of both offensive and defensive system. Additionally, the new triad also incorporates non-nuclear strike forces along with the existing nuclear forces. The emphasis on non-nuclear forces including conventional strike forces in totality represent that the U.S. will be less dependent than it has been in the past on the concept of nuclear deterrence (Paulson 2009:13:14).

4.7 THE INCOMPATIBILITY OF DETERERNCE AND DEFENCE

The transformation of security strategy from deterrence to defence appears mutually contradictory to the strategy of nuclear deterrence (Hynek 2010:439). Widely anticipated by the opponents of missile defence as either incompatible or indecisive for deterrence, the recent move of the U.S. to withdraw from ABM Treaty led to severe criticism across the world. The deeper investigation in this regard suggests that there are three negative impacts of missile defence, on basis of which we can analyse the incompatibility between missile defence and deterrence, wherein practical implications of missile defence on nuclear deterrence can be seen. Firstly, missile defence could reduce the credibility of the strategy of mutual vulnerability and in a reverse would destabilize the strategic relationship between the U.S. and Russia. Secondly, missile defence, as we are witnessing today has "legitimized the withdrawal of ABM Treaty (Hynek (2010:440)." Finally, missile defence could initiate new arms race and in a reverse destabilize deterrence stability with small nuclear states.

4.7.1 IMPACT OF MISSILE DEFENCE IN REDUCING THE CREDIBILITY OF NUCLEAR DETERRENCE AND TO RISING TENSIONS WITH RUSSIA

One of the main areas of concern over the development of missile defence is its potential impact on the fundamental concept of deterrence (Brennan1969:439). In the words of Shinichi:

> Missile defense makes a doubt about effectiveness of retaliation capability and pushes to build up missile capability and if one nation at loggerheads with one another deploys missile defense, it would destabilize mutual deterrence and heightens the danger of nuclear wars (Shinichi 2004:111).

Since deterrence stability is based on mutual vulnerability, the pursuit of missile defence by one country would deny other's capability to retaliate; and in this way it reduces the vulnerability of mutual destruction (Soofer 1988:88). Consequently, the qualitative and quantitative expansion of missile defences would necessarily lead to the revival of cold war rivalry between the U.S. and Russia (Kumar 2008b:70, Futter 2011:254). As analysed by Kumar, "if the U.S. develops ballistic missile systems to protect its cities from ballistic missile and nuclear attacks, in reaction Russia may develop anti- satellite weapons (ASATs) capable of destroying the U.S space based system (Kumar 2008b:72)." Thus, the transformation of a strategic environment from deterrence to defence has given rise to greater controversy over the critical relationship between the U.S. and Russia.

Since the end of the Cold War; many decisions especially the decision to develop national missile defence in Central Europe by the United States have been negatively perceived by Russia (Kron 2009:1). The cause appears to generate the fear that American missile defence would affect Russian deterrence (Karp 2006:69). The deterrence problem here occurs because Russia assumes that the effective National Missile Defence (NMD) "would be used by the U.S. to strike first on Russian capabilities and in reverse Russia would not be able to retaliate, because effective BMD would intercept the remaining Russian missiles (Kumar 2008 72-73)." Yury Zaitsev, an advisor at the Academy of Engineering Sciences, in this context observes that the European missile defence system developed by the North Atlantic Treaty

Organization (NATO) under the leadership of the U.S. is "certainly designed not to defend from a mythical missile threat on the part of Iran and North Korea, but from what Western politicians believe could be a possible attack by Russian ballistic missiles".[30]

Missile defence in this way has become a growing concern for Russian security because it finds itself surrounded by a belt of NATO interceptor missiles along its western borders. Many specialists assert that Russia is going to deploy tactical missile systems near the NATO borders[31] against such move. In light of these developments, Kron (2009:22) stated that any action meets a counter-action, and this is the true case with elements of the U.S. missile defence in Poland and the Czech Republic. Thus, the attempt to develop effective missile defence by the U.S. especially against rouge states that has perceived by Russia as an attempt to erode its strategic deterrence and relations between the two countries reached a new uncertain direction. In this case the missile defence would only increase their huge defence expenditures without any gain in real security to either side (Brennan1969:443).

4.7.2 MISSILE DEFENCE LEGITIMISES THE WITHDRAWAL OF ABM TREATY AND UNDERMINES THE DETERRENCE AS THE BASIS OF STRATEGIC STABILITY

The greatest cause of concern over BMD lies for their potential to undermine negotiation for arms control and to stimulate a new arms race (Bowen 2001: 496). By withdrawing from ABM Treaty on June 13, 2002, Bush has made clear that Cold War strategy of nuclear deterrence in the form of assured destruction is not only 'inadequate but also detrimental' to defend nation or citizens (Peoples 2010:182, Karp 2006:61). Thus, the effect of BMD may have different directions. On the one hand, it has legitimised the right to developed missile defence and thereby rendered the logic of 'mutual assured destruction as obsolete' and impotent (Hynek 2010:440); on the other hand the emergence of ballistic missile would create an offensive- defensive nuclear arms race "in which there would be far less stability, and so less security for all (Newhouse 2001:100-101)."

---

[30] Bridge, Robert (2012), "US missile shield may provide 'false sense of Security " [Online: web] Accessed 20 October 2012, URL: http://rt.com/politics/russia-us-missile-defense-shield-486/
[31] Ibid.

The most worst-case scenario of American unilateral withdrawal from the ABM Treaty would involve with the destabilizing counter-responses from Russia (Bowen 2001: 496). There is a strong possibility that Russia will withdraw from the Strategic Arms Reduction Treaty (START), which imposes mutual restriction on the U.S. and Russian land-based missiles up to ranges of between 500 and 5,000 kilometers (Bowen 2001: 497). Ultimately, this would lead to the revival of Cold War scenario of strategic arms race that would result in strategic instability. Thus, the prospect for a future negotiation for the arms control seemed to be impossible.

4.7.3 MISSILE DEFENCE DESTABILISES DETERRENCE STABILITY WITH SMALL NUCLEAR STATES

One of the practical implications of missile defence as we are witnessing today is that missile defence destabilizes deterrence stability of small nuclear states. The fear of the death of ABM Treaty has lead to massive development of strategic ballistic missile defences and pulling small nuclear states "to spend great sums to restore their deterrents (Soofer 1998:88)." This scenario can be explained with an example - just like Russian negative concerns over America's BMD plans, China also worries about the U.S. missile development, as "Beijing assumes that a U.S missile would be directed against Chinese forces (Newhouse 2001: 106)." This assumption has lead to the detrimental impact on the triangular relationship between the USA, China and Taiwan and, the negative consequences for regional security. In this respect, Chinese anxieties have been exacerbated by a perception of growing prospect of an American aid to Taiwanese BMD system that could reduce Taiwan's vulnerability to China (Rajagopalan 2004a:208) and more importantly it makes Chinese strategic deterrence ineffective to deter American intervention on Taiwan in the event of a future deterioration in China-Taiwan relations (Bowen 2001 488). In such a situation as Ambassador Sha Zukang stated "though China has not and will not participate in an arms race with anybody, but neither will we sit on our hands and allow our legitimate security interests to be compromised by anyone."[32] Further, there is a strong element of truth to this argument, that China would counter react toward American BMD programmes by increasing its missile strength (Rajagopalan 2004a:210).

[32] Bin Li (2001), "The Impact of the U.S. NMD on the Chinese Nuclear Modernization, Institute of Science and Public Affairs China Youth College for Political Science [online web] Accessed 17 October 2012 URL http://www.emergingfromconflict.org/readings/bin.pdf

However, this emerging deterrence problem between the U.S. and China could cause a similar cycle of nuclear arms building in South Asia (Newhouse 2001:107). As China possess greater missile superiority in contrast to India, it has the ability to strike first deep into the Indian territory and in reaction India may not able be to retaliate (Kumar 2009b:41). Hence, in this context, we can say that destabilisation of nuclear deterrence would create a new tension between regional nuclear powers. Such contentions flow from a belief that any kind of national missile development provokes the possibility of indigenous BMD programmes in the region, which in turn gives rise to the fear of future integrity of nuclear deterrence (Gizewski 2001:529, Rajagopalan 2004a:208). This scenario has rather perceptively observed by Gizewski (2001:529) as he rightly asserts that missile defence is triggering an automatic chain reaction of missile proliferation between the U.S., China, India, Pakistan and possibly others are somewhat more compelling to fall in that line. Thus, the impact of BMD on nuclear deterrence is not limited to the U.S. relations with Russia rather extended to the transatlantic relationship. As one commentator claims that the possible impact of any type of missile defence is high because it is unlikely to enhance global security above levels offered by retaliatory deterrence (Lebovic 2002:445).

4.8. MISSILE DEFENCE IN COMPLEMENTING DETERRENCE IN THE TWENTY FIRST CENTURY

"*Missile defenses are not a replacement for an offensive deterrence*; *they instead constitute an additional and critical dimension of contemporary deterrence* (Hynek 2010:439)" [Originally not in italic].

On the surface this quoted statement seems feasible. If "the logic of denial begins at the point when deterrence fails", it believes that the addition of defences could extend the use of deterrence beyond the framework of nuclear retaliation (Rajagopalan 2005b:23). Following this logic, some argued that the development of ballistic missile, would be neither destructive nor a destabilizing phenomena, but rather "a virtual panacea to the painful dangers and political limits of nuclear deterrence (Karp 2006:65)."

However, to understand the above conceptualization, first of all it is necessary to assess the different nature of missile defence in different period of time rather than to assess the framework of a larger strategy in which it perform its function. During the period of Cold War, missile defence was complemented by a strategic offensive arsenal instead of being complemented by defensive arsenal in which the main function of missile defence was to deter rather than to destroy aggression (Hynek 2010:443). To puts simply "the strategic postures of the superpowers were dominated by the logic that, since we could not defend, we had to deter (Brennan 1969:442)." To the contrary, missile defence in the era of post cold war, is not dealing with it failure ability to deter others but rather countering the ability of others to deter' (Karp 2006:75). It has been more perceptively observed by Soofer (1988) as there is a distinction between destroying the incoming Soviet nuclear strike against the United States and deterring a Soviet invasion of Western Europe by the ultimate threat of the U.S. nuclear attack upon the soviet homeland. The failure to understand this complexity of missile defence gives rise to the concept of what scholar called "the indeterminacy of deterrence and defence (Karp 2006:63)." In words of Hynek:

> The usual misunderstanding of the BMD and deterrence relationship has its roots in the parallel processes of identifying the logic of deterrence by punishment with the logic of deterrence by denial or treating them as mutually interchangeable and separating missile defence from carrying out deterrence threats within the MAD framework (Hynek (1987:437).

While the cold war strategy of nuclear deterrence stressed the value of offence over defence, the new locus of nuclear strategy of post-Cold War era is of what most scholars termed as "the synchronization of deterrence and defense (Haffa et al; 2009:27)." And it is on the basis of this perception, Hynek (1987:440) believes that deterrence and missile defence as complementary rather than mutually exclusive opposites of each other.

Deeper investigation of this statement suggests that there are two different missile defence scenarios, on the basis of which we can analyse the possible synchronization of deterrence and defence. These are - (1) missile defence in the process of reassuring the credibility of traditional deterrence, and (2) missile defence in strengthening regional deterrence.

4.8.1 MISSILE DEFENCE IN REASSURING THE CREDIBILITY OF TRADITIONAL DETERRENCE

Procuring defences' is like buying insurance against the failure of traditional deterrence (Brennan 1969:434, Peoples 2010:186) [Originally not in italic].

The missile defence aims to complement the traditional deterrence as stated in above quoted statement it gives second round deterrence by generating effective defence mechanism even in those cases where the traditional retaliatory deterrence loses its credibility to deter the rivals. In other ways, if doubts concerning the uncertainty of nuclear deterrence of the 21st century are the result of the failure of nuclear weapons to deter dreadful terrorist groups, it is believed that strengthening nuclear deterrence through missile defence might be helpful to fulfill the crisis confidence in deterrence which in turn enhance the credibility of nuclear deterrence (Paul 2011: 1). A thorough investigation in this context reflects that the leaders of rogue states or terrorist groups are 'irrational'[33] because of lack of clear command and structure, identity and sometimes even without a land and thus, they are undeterred by the prospect of retaliation with thousands of nuclear warheads (Lebovic 2002:458). As one commentator argues, deterrence as promise of massive retaliation against nations- means nothing against shadowy terrorist networks with no nation or citizens of defend (Smith 2006:3).

In this view, it may be said that a missile defence system would provide new capabilities to deter extreme crisis because it would destroy the first attack by potential enemy without compromising with one's existential deterrence capability of retaliation. Here the concept of vulnerability no longer works for the possessor of missile defense mechanism. This logic has provided sufficient grounds for justifying the need to have a missile defence (Hynek 2010: 442).

The case for missile defence as a deterrence is also strengthened by the event of warfare in the Persian Gulf. Thompson (1998:54) while assessing the role of U.S. ballistic missile claims that deterrence strategy of missile is founded on denial of Iranian surface-to-surface threat through the use of world's most advanced BMD capabilities successfully demonstrated the efficacy of missile defence to deter threats. The 2010 Ballistic Missile Defense Review (BMDR) reinforces its faith in ballistic missile defence by reaffirming that:

[33] The traditional concept of deterrence is based on three different principles; namely, rationality, credibility and effective communication treats (Barkley, 2008:456). Following the strategy of deterrence, rationality is the logical thinking about the consequences of destabilizing retaliatory deterrence. Hence in this context, if adversaries are irrational, deterrence is impossible (Stein 2011:59).

> Strong and effective missile defenses are intended to have a deterrent effect by making clear to potential proliferators the impossibility of gaining an advantage in threatening to employ or employing ballistic missiles (Thompson 1998:54).

4.8.2 MISSILE DEFENCE IN STRENGTHENING REGIONAL DETERRENCE

The rising trend of fear posed by ballistic missiles across the globe is no longer a concern of Russia and the U.S. as various small states are also vulnerable to ballistic missile attacks by regional adversaries and expendable terror groups. On the one hand, ballistic missiles are used by regional adversaries as a long-range weapon in regional conflicts and annexation of non-nuclear states; on the other hand they are the weapons of power projection for many regional states outside the world (Hynek 2010:444). The recent experience of Iran-Iraq War and the Persian Gulf War has successfully demonstrated the threat of ballistic missiles in the Middle East countries of the world. Although, the Middle East is not only the region that witnessing the combat use of ballistic missiles other regions such as South East Asia are also modernizing their ballistic missile forces (Russell 2002:484-490). This phenomenon, coupled with accelerating missile proliferation led to greater concern for regional security. Much of the sustenance for these increasingly pessimistic visions of growing missile threats came from the findings of the 2010 Ballistic Missile Defense Review (Peoples 2010: 219). The central finding of the Ballistic Missile Defense Review (BMPR) asserted that growing Iran's ballistic missile programme will be create both a regional threat and a potential threat to the U.S. (Johnson 2010:21).

Recognising the seriousness of ballistic missile threats from regional adversaries the U.S President Barack Obama has made international co-operation on missile defence as a key policy to secure regional security (Rose 2012), which is postulated by the Obama administration's decision to expand to expand the U.S. missile defence capability into areas such as Europe, East Asia, and the Middle Eastern countries, in order to strengthen regional nuclear deterrence (Futter 2011b:256). By announcing the U.S new missile defence policy, the Phased Adaptive Approach (PAA) for Europe, President Obama has even make more comprehensive missile defence commitment to the regional level security (Johnson 2010:18, Futterb 2011:256). This new system is particularly designed to destroy long- range ballistic missile threats posed by Middle East Countries. The next significant landmark achievement in missile defence co-operation happened in November 2010 of NATO-Russia Council (NRC) summit, which was held in Lisbon in conjunction with the NATO alliance and Moscow in the area of missile defence (Hildreth 2011:8). The NRC summit looks forward to strengthen missile defence co-operation between Russian and NATO by taking joint missile defence programme (Boese 2004).

Hence in this context, one can say that apart from renewed traditional deterrence, missile defence may even provide many plausible ways to re-ensure credibility of deterrence in the 21st century. On the one hand, missile defence bolsters the deterrence against regional adversaries of the U.S. such as Iran or North Korea; on the other hand , the development of ballistic missiles armed with both conventional and nuclear weapons, would provide a strong shield where weak and non-nuclear states would find themselves vulnerable to regional adversaries (Bowen 2001:489). In this regard Karp (2006:75) writes that rather than de-coupling, missile defences will tend to strengthen American willingness to uphold defence commitments by assuring protection to allies and partners against missile threats from others and facilitating support for intervention in regional conflicts, especially against adversaries. This is the key reason for 'rising expectation of missile defence' in various parts of the world (Karp 2006:75).

4.9 SUMMARY

This chapter discusses the impact of ballistic missile defence on nuclear deterrence by focusing on how deterrence and defence discursively relate to each other. In this regard, missile defence has mixed effects on nuclear deterrence as well as strategic stability. This claim is made on the basis of two different logics-

The first logic claims that missile defence destabilises nuclear deterrence on the basis of following three reasons. Firstly, missile defence and nuclear deterrence is incapable of existing together because the development of ballistic missile defence would adversely affect the strategic stability as deterrent relationship is based on retaliatory capability. There remains a strong element of truth to this argument as we have already noted that destabilization of mutual deterrence is triggered by deployment of missile defence which would cause a new tension between the tragic relationship of the U. S. and Russia (Shinichi 2004:112). Thus, there lies a strong possibility that missile defence will eliminate the only reliable barrier to historic offensive-defensive warfare. Secondly, the ABM Treaty is formed the strategy of retaliatory deterrence. Hence, in this context the death of ABM Treaty would, of course, undermine deterrence stability. This, indeed, happens because if one country gets protection by missile defences, it would no longer consider itself deterred from aggression by rivals (Soofer 1998:150). Thirdly, if one country's missile defence is largely considered by another country as a threat, it could of course lead to 'a chain reaction of ballistic missile arms race' (Russell 2002:484). Therefore, the threat of ballistic missile is not confined to any particular territory. As Rajagopalan (2004a:207) puts this puzzling situation in better way by stating that as American BMD plans impinge on Chinese deterrent capabilities, and Chinese reactions affect India's nuclear deterrent, which in turn forces a Pakistani reaction and as a side effect it would destabilized strategic stability in South Asia.

The second logic claims that missile defence does not undermine deterrence, rather it contributes more to realign deterrence by mixing the concept of deterrence with offensive and defensive forces (Soofer 1988:151). As such any kind of BMD development has not imposed official restriction on build up offensive forces, in fact, the development of these defences may even provide an additional ancillary to the offensive forces in reinforcing deterrence stability (Karp 2006:64). In addition to strengthening traditional deterrence, 'missile defenses support a number of defensive strategic goals also (DOD 2012:12)' such as more recently using ballistic missile defence capability to help allies via extended deterrence including the 'nuclear umbrella'[34], has been given a common ground for judging the adequacy of ballistic missile defence (Payne 2011:13). Thus, the central point is to recognize that:

> Deterrence is the inevitable basis for international security and it can be rendered significantly more stable by adopting more defensive operational postures designed to deny the purpose of an aggressive attack rather than to compete with it in character and timing (Steinbruner 1987:24)

[34] "Nuclear umbrella means to deter a military attack against an ally or a friendly nation through use of nuclear arms and intimidation of its escalation, and serves as an important pillar of extended deterrence (Shinichi 2004:112)".

CHAPTER 5

CONCLUSION

The intensive security system of the state depends upon the matrix of both offence and defence capability. However, the preponderance of defensive ballistic missile developments and their warheads of mass destruction have generated a global shift in approach of security experts from offensive deterrence to defensive deterrence by reducing the efficacy of retaliation capability or nuclear deterrence. In fact, the last few decades have seen the unbalanced growth in the area of weapons of mass destruction and their carriers or ballistic missiles which necessarily invited the control regime under several international treaties like NPT, PTBT and ABM. In such an environment, the investment of defence resources in the development of defensive mechanism is considered as wise policy. However, this wise policy has paved the way for several paradoxes and has far-reaching implications at global security concerns.

An in-depth study of previous chapters on missile defence and nuclear deterrence reveals two contrasting ideas regarding the impacts of missile defence on nuclear deterrence. On the one hand while traditional role of nuclear deterrence is eroding due to the development of missile defence, at the same time on the other hand, efforts to strengthen deterrence by denial (BMD) is also continuously increasing with same pace. The concluding chapter examines this dichotomy. For the sake of convenience, the chapter is divided into two sections. The first section would attempt to revisit the relevant parts of our previous chapters to explore the key paradoxes related to the nuclear deterrence and ballistic missile and its implications across the globe so as to test the veracity of statements as hypothesized in chapter 1. The second sections would highlight in nutshell about the probable future direction and implications of BMD based on our research understandings.

The initial chapter of this study analyses the conceptual development of ballistic missile defence, its technological specifics and re-evaluates the history of BMD and arms control negotiations between the United States and former Soviet Union. This chapter argues that the emergence of ballistic missile defence in the contemporary era has changed security policy. The extent to which Ronald Reagan initiated the BMD research and developmental programmes made BMD a key element to pursuit security. Subsequently American withdrawal from the 1972 ABM Treaty and highly optimistic goal to establish NMD system has generated international interest in missile development. With reference to more recent technological developments for missile defence, chapter 3 analyses the extension of BMD systems of various countries. This chapter argues that in the post- Cold War era India, China and Israel emerged as major players in this sector.

The sudden rapid growth of ballistic missile defence in the post Cold War era has dual impacts. On the one hand though it has significantly reduced nuclear deterrence, but on the other hand, the aggressive unilateral policy of the U.S. on global security issues in particularly its withdrawal from the ABM Treaty marked the other form of arms race that can be termed as defensive arms race. The overemphasis of President George W. Bush administration on research and development of BMD and placing it even out of North American continent has seriously jeopardised the existing global security order. The defensive policy of the U.S. BMD as outlined by the Bush administration is primarily designed against small rouge countries and terrorist attacks or activities. The administration ruled out its intention of shielding against large states like Russian or Chinese ballistic missiles. However, since strategic relationship between the U.S. and Russia is based on mutual retaliation and promise of mutual destruction, the pursuit of BMD by the U.S. significantly reduces the Russian capability of retaliation against the U.S in case of a confrontation. In Cold War days, where deterrence was predominantly based on nuclear weapons, the balance of threat was tilted in Russian favour because it had more nuclear weapons than the U.S. However this advantage was balanced by the U.S. with its stronger war alliance of NATO. Thus, the global order were fairly balanced and secured, till 2001, when the U.S. withdrew from ABM treaty of 1972. It suddenly unbalanced the existing order and created fear amongst Moscow strategists. In fact the U.S. BMD developments generated number of reasons for Russian concern against the U.S. approach on BMD such as the U.S. BMD is not only confined to the United States but is also extended to its allies (NATO members) in Europe as well as Middle-East (Israel). From the analysis in chapter 3 it was found that the U.S. PATRIOT missile and the U.S.-aided Israeli Arrow missile have tremendous advantages over Russian BMD or Chinese infant missiles defence largely depended upon Russian technologies.

Most of the NATO members like Germany, Britain, and Israel etc. also have their own BMD but on the other hand Russia hardly has any such ally empowered with BMD technologies. Further, the Russian defence research was also halted in post cold war times because of its collapsed economy. In such case, we find, there is also an asymmetric distribution of BMD capacity on two cold war factions particularly between Russia and the U.S.

Though Russia has a long rivalry with the U.S., the U.S. is more concerned about its future potential rival China and its emerging closeness with Russian tune on global security issues. The rapid growth of Chinese GDP helped it to increase its defence budget and a chunk of that budget is now being diverted towards developments of Chinese BMD (HQ series) and Anti-Ship Ballistic Missiles (ASBM) developments. There are number of reasons for Chinese concerns over the U.S. BMD defences. China perceives itself prone to the U.S. containment policy under its much publicised policy of 'Asian Pivot'. Chinese concerns seem to be logical because the U.S. has already installed its BMD in South Korea, Japan and now actively helping India as well to acquire Israeli Arrow Missile technology. Again, whereas China thinks that the U.S. might affects its economic expansion through military might, the USA sees China as benevolent state which might attempt to alter the existing security order by force. In such cases, China which is at a disadvantageous stage today will fairly balance its military power in next few decades. Thus, this disadvantageous position of Russian-Chinese BMD is another reason which security experts find as breeding ground for destabilising the global security order defined under retaliatory capacity. Here, Russian and Chinese military has obvious reason to enter into global race of BMD technologies at par with the U.S. capacity which of course the U.S. would not like, and thus, this race would continuously go on and on. In other words they will enter in game of chicken.

Again, when we analyse BMD from small powers point of view, we find that it tends to destabilise the regional security order. For example, the stable South Asian security order is defined under nuclear deterrence of China, India and Pakistan but once China takes the U.S. on opposite side by engaging in BMD race, India would become bound to balance China and so will Pakistan following India. In fact, India has fought one war with China, and three formal wars and one informal war with

Pakistan. Thus the three big Asian states have been historically hostile to their neighbours. Many analysts speak that India didn't resort to any direct military adventurism against Pakistan since it acquired nuclear coverage reflects that nuclear deterrence is an effective mechanism for peace and security as argued by Waltz that peace lies in extension of states empowered with nuclear weapons and not in their limitations. However, now if India will acquire a credible BMD capable of identifying and destroying the incoming ballistic missiles carrying nuclear arsenals either from Pakistan or China, it will enhance the political powers in New Delhi to take some risks because its BMD will destroy the first strike capability of its hostile neighbours and thereby it would sharpen its nuclear retaliatory capacity. Thus, once the nuclear threat is discredited by India, Pakistan will become vulnerable to the military adventurism of Indian Army which will ultimately destabilise the existing security order and Pakistan will be forced to go for its own development of ballistic missiles. In fact, India is already working on several BMD projects most of them indigenously developed broadly classified under Advance Air Defence (AAD) System and Prithvi Air Defence (PAD) System. India is also attempting to acquire Israeli Arrow missile technology.

Though India's BMD systems possess greater advantage than Pakistan, the recent Chinese engagement to develop a missile defence system for Pakistan has intensified future threats to India. A strong desire for acquiring BMD technology either by India or Pakistan would inevitably raise the strategic temperature between India and Pakistan, and would thereby have an adverse impact on the nuclear deterrence stability in the region and the existing peaceful order might turn-up into a more aggressive relationship defined by unstable nuclear threats in South Asia Region. In this way the stable security order will be destabilised. In other words, the net effect of the assessment reveals that BMD has generated a new wave of suspicion and threat marking a new beginning of cold-war not defined in terms of armed race based on retaliatory and mutual destruction capacity, but containing other's retaliatory capacity. Thus, the first hypothesis of the research " *BMD will change the deterrence relationship with stable nuclear powers and the effect of BMD is primarily destabilizing deterrence policy as it operates in dramatically different situations that are often complex, multisided and largely asymmetrical*" is true.

A stable security order is one which is capable to deal with the changing security threats. The technological advancement of 21st century has made the world more vulnerable. The bombardment or nuclear threat is not a phenomenon of a rational sovereign country having land, population, property, a clear accountable command structure. These threats can be posed by a small number of terrorists disguised in general public in different countries as in the case of 9/11, 2001 terrorist attack in the U.S. Since the nuclear threat is directed against a sovereign state, it is not able to deter such groups without having a sovereign lands and much to lose. In such cases we find that BMD acts as complimentary to fulfill the existing aperture of global security order based on retaliatory capacity or nuclear deterrence.

The complementary nature of BMD can also be explained by Israeli BMD developments. In the Middle East, only Israel is believed to have nuclear arsenals as well as a strong BMD coverage through its Arrow and Iron Dome missile defences. Israel has historically surrounded by still active hostile neighbours. Traditionally, it had advantage over its neighbour's countries because of its superiority in military might as well as under nuclear deterrence. However, those days are gone, now it is fighting with several extremists groups across many countries. At the same time, its neighbours have also acquired sophisticated weapons and are believed to have acquired chemical and biological weapons. Israel is concerned about falling of such weapons in hands of the extremists groups, and being a very small state, it would hardly have any second strike capacity. So to counter such extremists groups, missile defense helps Israel to prevent any accidental or deliberate attacks of such weapons either by extremists groups or hostile neighbours. On the ground of this analysis we can say that the third hypothesis concerning the dialectic relationship between the logic of nuclear deterrence and missile defence is correct in the sense that missile defence provides nuclear deterrence an additional layer to ensure security stability in which missile defence discursively relate with the credibility of nuclear deterrence.

Ideally, missile defence or denial by deterrence and the strategy of nuclear deterrence (deterrence by punishment or retaliation) are mutually not interchangeable but they are compatible with each other under certain circumstances. This contradiction between deterrence and defence becomes clear once we interweave the two facts together. The conceptual analysis of the nature of deterrence in chapter 4 has separated post war strategy of deterrence by denial (BMD) from the cold war strategy of nuclear deterrence. The post-war strategy of deterrence described in chapter 4 provides us a distinct view of ballistic missile defence as deterrence by denial, the attempt to prevent an adversary from achieving its objectives rather than deterring adversary by the threat of cold war strategy of nuclear retaliation. The strategy of nuclear retaliation is relevant against sovereign states and BMD is relevant against such cases where the traditional retaliatory deterrence loses its credibility to deter the rival especially in case of first strike attack by rouge states and groups like terrorists organizations. Thus, in some cases, nuclear deterrence will still be essential; in others, however, denial by deterrence (BMD) will play the crucial role. Both may go side by side and strengthen the contemporary security order by strengthening the deterrence rather than collapsing it, through their mutual set-off of loopholes. From such analysis it is found that the second hypothesis –"*we need compatibility between missile defence and nuclear deterrence for future strategic stability*" is logically true.

FUTURE IMPLICATIONS

On ground of this extensive and in-depth research, the future implications of our BMD research may be summarised below:

1. Design, structure and technology used in BMD are never constant. It is in a continuous evolution process. What was considered as a dream in 1950's is reality today and thus we can predict that in coming days the world will see rapid growth of these defensive technologies because of unbalanced growth of offensive technologies. The countries are expected to divert a major chunk of their defence budget towards ballistic missile defence especially by those countries which find themselves at disadvantageous position.

2. The BMD technology is expensive technology in comparison to the development of offensive mechanism. Therefore, in spite of technological jump of BMD from one continent to the other, its extension is more likely to be in hand of limited countries which find themselves threatened by military action in future either due to territorial disputes or due to forceful attempt to challenge the existing security order.

3. The rapid boom of petro dollar economies of Middle-East countries that are ruled by religious conservatives and semi-dictators have posed severe threat to existing security order e.g. Iran's willingness to acquire nuclear weapons along with publically threatening to wipe-out Israel from world's map will necessarily destabilise the security order in Middle-East because the Arrow ballistic missiles of Israel will enables it to block the Iranian retaliatory capacity and in turn Iran would be bound to go for either developing its own BMD or sharpen its retaliatory policy by acquiring ultimate weapon of destruction or nuclear weapons. Whatever be the case, it would necessarily destabilise the current security order.

4. The balance of power defined in terms of retaliation at global, regional and domestic level will change. The ballistic missile defence will help in proliferation of alliance ballistic missile systems and might have a negative implication on controlling deadly arms race. The possessor of BMD technology might give a short term advantage over its rival country but with the extension of same technology to its rival by opposite fraction might escalate the defensive race best defined as 'chicken play'.

Thus we can conclude that the development of BMD like other innovations has two implications - one positive and other the negative one. Under positive side whereas, BMD strengthens the existing security order by removing the gaps or loopholes in nuclear deterrence, on the negative side BMD also destabilizes the existing security order by creating a new web of suspicion about effectiveness of nuclear deterrence as BMD undermines its retaliatory capability. It's asymmetrical development which is confined to few powerful states also led to the emergence of deterrence problems for small nuclear states whose protection was guaranteed by nuclear deterrence. Yet, even with this catastrophic effect, missile defence is practically inevitable because the states find no other alternative to deal with emerging undeterrable or intolerable threats. Hence, the time demands the harmonization of the concept of nuclear deterrence and BMD in such a way that both can go alongside to strengthen the contemporary security order.

REFERENCES

(*indicates a primary source)

Adams, Benson D. (1971), *Ballistic Missile Defense,* New York: American Elsevier Publishing Company, Inc.

Afanasyev, Igor (2007), "The legacy of the V-2: The First Soviet Ballistic Missiles", *The Journal of Slavic Military Studies,* 11(4):164-174.

Ahlstrom, Christer (2004), "Arrows for India? Technology Transfers for Ballistic Missile Defence and the Missile Technology Control Regime", *Journal of Conflict & Security Law,* 9 (1): 103-125.

AICE, the American- Israeli Cooperative Enterprise (2012), "U.S.-Israel Military Cooperation: Missile Defense", a Project of the AICE, Washington, D.C: Jewish Virtual Library, [Online: web] Accessed on 27 November 2012 URL: http://www.jewishvirtuallibrary.org/jsource/US-Israel/missile_defense.html

Amin, Musarat et al. (2011), "Realism - Dominating Theory in International Relations: An analysis", *Berkeley Journal of Social Sciences,* 1(7), [Online: web] Accessed on 27 November 2012 URL: http://www.berkeleyjournalofsocialsciences.com/July1.pdf

Barkley, Daniel (2008), "Ballistic Missile Proliferation: An Empirical Investigation", *Journal of Conflict Resolution*, 52 (3):455-473.

Basu, Durga Das (2006), *Introduction to the constitution of India*, Nagpur, New Delhi: Wadhwa and Company Law.

Benjian, XIN (2001), "Security Dilemma, Balance of Power VS. US Policy towards China in the Post-Cold War Era", *Xiandai Guoji Guanxi*, [Online: web] Accessed on 27 November 2012 URL: http://www.uscc.gov/researchpapers/2000_2003/pdfs/secur.pdf

Benson, Sumner (1997), "Will NATO deploy European missile defenese?" *Comparative Strategy*, 16(4): 385-397.

Bertucchi, Colonel Marc R. (2001), "U.S. National Missile Defense (NMD) and European Security", *Strategic Research Project*, Carlisle Barracks, Pennsylvania: U.S. Army War College.

Bethe, Hans A. et al. (1985), “BMD Technologies and Concepts in the 1980s”, *American Academy of Arts & Sciences,* 114(2):53-71.

Boese, Wade (2004), "NATO, Russia Hold Joint Missile Defense", Arms Control Today, 34(10), [Online: web] Accessed on July 5, 2012 URL: http://www.armscontrol.org/act/2004_04/MDExercise

Bosch, Miguel, Marin (1995), “The 1995 NPT Review and Extension Conference”, *Irish Studies in International Affairs,* 6: 23-31.

Bowen, Q. Wyn (2001), “Missile Defence and the Transatlantic Security Relationship”, *International Affairs*, 77 (3):485-507.

Brams, Steven J. and Kilgour, D. Marc (1988), “Deterrence versus Defense: A Game-Theoretic Model of Star Wars”, *International Studies Quarterly,* 32 (1): 3-28.

Brennan, D.G. (1969), “The Case for Missile Defense”*, Foreign Affairs*, 47(3):433-448.

Carter B. and Schwartz, David N. (eds.), *Ballistic Missile Defenses,* Washington, D.C.: Brookings Institution, Massachusetts Avenue N.W.

Center for Defense Information (CDI) (2000), “National Missile Defense What does it all Mean?” Washington, DC: Center for Defense Information, 1-49, [Online: web] Accessed on 30 May, 2012 URL: http://online.physics.uiuc.edu/courses/phys280/spring12/archive/2000-09-00_CDI_Book_on_NMD.pdf

Christensen, Homas J. (2012), “The Meaning of the Nuclear Evolution: China's Strategic Modernization and US-China Security Relations”, *Journal of Strategic Studies*, 35(4):447-487.

CIA, Central Intelligence Agency (1982), “Soviet Ballistic Missile Defense”, Accessed on November 2012, URL: http://www.foia.cia.gov/Reagan/19821013.pdf

Clarke, Duncan L. (1994), “The United States, Israel and Strategic Cooperation”, *Middle East Journal*, 48(3): 475-491.

Coffey, J. I. (1967), “The Anti-Ballistic Missile”, *Foreign Affairs*, 45(3): 403-413.

Collins, Gabe and Erickson, Andrew (2010), "China Deploys World's First Long Range, Land Based 'Carrier Killer': DF-21DAnti -Ship Ballistic Missile (ASBM) Reaches 'Initial Operational Capability' (IOC)", *China Signpost*, (14): 1-27, [Online: web] Accessed on 22 September 2012 URL: http://www.chinasignpost.com/wp-content/uploads/2010/12/China_SignPost_14_ASBM_IOC_2010-12-26.pdf

Colombo, Daniel J. et al. (2012), "A Tailored Top-Down Functional Analysis (TDFA) for AEGIS Ballistic Missile Defense (ABMD)", *Proceedings of the Human Factors and Ergonomics Society Annual Meeting,* 56: 753-757.

Davis, Jacquelyn k. et al. (1980), "The Soviet Union and Ballistic Missile Defense", Special Report of the Institute for Foreign Policy Analysis, Cambridge, Massachusetts: Institute for Foreign Policy Analysis, Inc. March 1980.

DeBiaso, Peppi (2006), "Proliferation, Missile Defense and the Conduct of Modern War", *Comparative Strategy,* 25(3): 157-171.

Defence Industry Daily (4 October 2012), 'Serious Dollars for Aegis Ballistic Missile Defense Modification (BMD)', [Online: web] Accessed on July 5, 2012 URL: http://www.defenseindustrydaily.com/serious-dollars-for-aegis-ballistic-missile-defense-modifications-03091/#ship-based-bmd

Deutch, John et al. (2000), "National Missile Defense: Is There another Way?", *Foreign Policy,* (119) : 91-100.

*DOD (2010), *"Ballistic Missile Defense Review Report 2003,"* USA: Department of Defense, pp: 1-47, [Online: web] Accessed on 22 September 2012 URL: http://www.defense.gov/bmdr/docs/BMDR%20as%20of%2026JAN10%200630_for%20web.pdf

Flax, Alexander (1985), "Ballistic Missile Defense: Concepts and History", *Daedalus*, 114(2): 33-52.

Frye, Alton (1996), "Banning Ballistic Missiles", *Foreign Affairs* 75(6): 99-112.

Futter, Andrew James (2011a), "The Evolution of the US Ballistic Missile Defence Debate 1989-2010 Institutional Rivalry, Party Politics, and the Progression Towards Political and Strategic Acceptance", PhD thesis, Birmingham, The University of Birmingham.

Futter, Andrew (2011b), "Getting the Balance Right: U.S. Ballistic Missile Defense and Nuclear Non-proliferation", *Comparative Strategy*, 30 (3): 254-267.

Futter Andrew (2012c), “Nuanced US Deterrence: Treating the Symptoms or Drivers of Nuclear Threats?” Lecture delivered on 2012 at UK PONI Annual Conference, ‘Nuclear Stability: From the Cuban Crisis to the Energy Crisis’, The University of Leicester : Leicester, UK.

Ganesh R N. (2012), *Nuclear Missile-Related Risks in South Asia,* Carlisle (US): Strategic Studies Institute of the US Army War College (SSI).

Gansler, Jacques S. (2010), *Ballistic Missile Defense Past and Future*, Fort Lesley J. McNair, Washington, D.C.: Center for Technology and National Security Policy, National Defense University.

*GAO, United States General Accounting Office (1993), “Ballistic Missile Defense: Evolution and Current Issues”, Report to the Chairman, Committee on Governmental Affairs, US Senate, Washington D.C.: GAO, GAO\NSIAD-93-229:1-84.

*GAO, United States General Accounting Office (February 1992), “PATRIOT Missile Defense: Software Problem Led to System Failure at Dhahran, Saudi Arabia”, Report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Science, Space, and Technology, Houseof Representatives, Washington D.C.: GAO/IMTC-92-26, [Online: web] Accessed on 1 December 2012, URL: http://www.gao.gov/assets/220/215614.pdf

Garwin, Richard L. and Bethe A. Hans (1968), “Anti- Ballistic Missile systems”, *Scientific American,* 218 (3): 21-31.

Gerson S. Michael (2009), “Conventional Deterrence in the Second Nuclear Age”, *Parameters*, 39 (3): 32-48.

Gizewski, Peter (2001), “The International Politics of Missile Defence: A Response to Harvey”, *International Journal,* 56 (3): 527-532.

Gobarev, Victor (2001), “The Early Development of Russia's Ballistic Missile Defense System”, *The Journal of Slavic Military Studies,* 14 (2): 29-48.

Goddard, Colin (2007), *The Development of Missile Defense Systems: From World War II to the Strategic Defense Initiative*, IS 4004. [Online: web] Accessed on 12 June 2012, URL: https://docs.google.com/viewer?a=v&q=cache:d61OLdONrk4J:www.psci.vt.edu/internationalstudies/priv_IS4004/Fall%25202007/Goddard%2520Strategic%2520Defense%2520Initiative.doc+Goddard,+Colin+(+2007),The+Development+of+Missile+Defense+Systems:+From+World+War+II+to+the+Strategic+Defense+Initiative&hl=en&gl=in&pid=bl&srcid=ADGEESg92RphS3CWnITisk9YeiX_oR3k

lmTNXq9D1Z2l-NYr44xIBcerSqbhIfUrF-Be0WnNEYyucBe8uwnAuUOFlNVzZPea2Sp_Bfmg8-A0kCbh2eor_2keZ_h5ZJJSeurUMbSy_yDu&sig=AHIEtbTfQUD7DZhhRfz3AQvYMPdt19Ikxg

Goswami, Namrata (2006), "The Essence of the South Asian Nuclear Debate", *Strategic Analysis*, 30(3) [Online: web], Accessed on 24 February 2012, URL: http://www.idsa.in/strategicanalysis/TheEssenceoftheSouthAsianNuclearDebate_ngoswami_0706

Grand Camille, (2001), "Missile Defenses: the Political Implications of the Choice of Technology" in CNS Occasional paper no.7 on 'Missile Proliferation and Defences: Problems and Prospects", Monterey: James Martin Centre for Non-Proliferation Studies, [Online: web] Accessed on 30 May, 2012, URL: http://www.mcis.soton.ac.uk/publications/missile_proliferation.pdf

Haffa, Robert P. Jr. et al. (2009), "Deterrence and Defense in the 'Second Nuclear Age' ", Los Angeles, California: Northrup Grumman Analysis Center, [Online: web] Accessed on 22 September 2012 URL: http://www.northropgrumman.com/analysis-center/paper/assets/Deterrence-and-Defense-in-seco.pdf

Harmer, Christopher (2012), 'Threat and Response: Israeli Missile Defense', *Backgrounder Journal*, Institute for the Study of War, 1-12, [Online: web] Accessed on 12 November 2012, URL: http://www.understandingwar.org/sites/default/files/Backgrounder_IsraeliMissileDefense_email.pdf

Harvey, John (1997) *Conventional Deterrence and National Security,* Fairbairn, Australia: Air Power Studies Centre.

Herzfeld, Charles M. (2008), "Ballistic Missile Defense and National Security", *Annals of the New York Academy of Sciences,* 134 (1):119-125.

Hicks, Brad et al. (2012), "The Aegis BMD Global Enterprise: A "High End" Maritime Partnership", *Naval War College Review*, 65(3):65-80.

*Hildreth, Steven A. (2007), "Ballistic Missile Defense: Historical Overview", Report by the Congressional Research Service (CRS) for Congress, RS22120, [Online: web] Accessed on 23 September 2012 URL: http://www.fas.org/sgp/crs/weapons/RS22120.pdf

Hofnug, Menachem (1996), *Democracy, Law and National Security in Israel*, Aldershot: Dartmouth Publishing Company Limited.

Holmes, Kim (1996), "Arms Control and Missile Defense Options: Contending Perspectives", in Robert L. Pfaltzgraff, Jr. (eds.), *Security Strategy and Missile Defense*, Herndon, Virginia, U.S.A. : The Institute for Foreign Policy Analysis in Association With the Fletcher School of Law and Diplomacy, Tufts University: Brassey's, Inc.

Hynek, Nik (2010), "Missile Defence Discourses and Practices in Relevant Modalities of 21st-CenturyDeterrence", *Security Dialogue,* 41 (4): 41-435.

Ivanov, Igor (2000), "The Missile-Defense Mistake: Undermining Strategic Stability and the ABM Treaty", *Foreign Affairs*, 79(5):15-20.

Jb2ookworm (2008), "Soviet Military Power 1986: Strategic Defense and Space Operations", [Online: web] Accessed on 30 May 2012 URL: http://www.scribd.com/doc/7996763/Soviet-Military-Power-1986-Strategic-Defense-And-Space-Operations

Jaspal, Zafar Nawaz (2001), "India's Missile Capabilities: Regional Implications", *Pakistan Horizon,* 54 (1): 33-64.

Jaspal, Zafar Nawaz (2011) "Ballistic Missile Defense: Implications for India-Pakistan Strategic Environment"*, National Defence University Journal*, Islamabad, 25:1-26.

Johnson, D. Colonel John (2010), "Iranian Ballistic Missile Threat and a "Phased, Adaptive Approach" for Missile Defense in Europe: Perceptions, Policies and Scenarios", Research Project, Garmisch Partenkirchen: Germany College of International Security Studies, George C. Marshall European Center for Security Studies, (degree Senior Fellows Program) [Online: web] Accessed on 23 September 2012 URL: http://cdm15289.contentdm.oclc.org/cdm/singleitem/collection/p15289coll2/id/11

Durr, Colonel Charles W. Jr. (2002), "Nuclear Deterrence in the Third Millennium", *Strategy Research Project*, Carlisle Barracks, Pennsylvania: U.S. Army War College.

Thompson, Sonny. A. Jr. (1998), "*Deterrence by Denial: The Efficacy of U.S. Missile Defense in the Persian Gulf as a Deterrent against the Iranian Regional Missile Threat"*, Master Thesis, New York, United States Military Academy.

Karp, Aaron (2006), "The new indeterminacy of deterrence and missile defence' in Ian R. Kenyon and John Simpson (eds), *Deterrence and new Global Security Environment,* Abingdon: Routledge Taylor & Francis Group.

Kenson Ian R. and Simpson John (eds) (2006), *Deterrence and new Global Security Environment,* Abingdon: Routledge Taylor & Francis Group.

Kerr, Paul K. and Nikitin, Mary Beth, (2012), Pakistan's Nuclear Weapons: Proliferation and Security Issues, Congressional Research Service: 1-29, [Online: web] Accessed on 23 October 2012 URL: http://www.fas.org/sgp/crs/nuke/RL34248.pdf

Klingner, Bruce (2011), "The Case for Comprehensive Missile Defense in Asia", *Backgrounder,* Published Heritage Foundation, USA, (2506):1-12.

Koblentz, Gregory (1997), "Theater Missile Defense and South Asia: A volatile mix", *The Non-proliferation Review,* 4(3): 54-62.

Kristensen, Hans M. et al. (2004), "The Protection Paradox", *Bulletin of the Atomic Scientists",* 60 (2): 68-77.

Kron, Robert (2009), *The Impact of United States National Missile Defense on US – Russian Relations,* M.A Thesis, Chapel Hill, Carolina: University of North Carolina.

Kumar A. Vinod (2008a) "A Phased Approach to India's Missile Defence Planning", *Strategic Analysis*, 32(2):171-195**.**

Kumar, A. Vinod (2010d), "The Dragon's Shield: Intricacies of China's BMD Capability", the Institute for Defence Studies and Analyses (IDSA) Issue Brief, New Delhi: IDSA, 1-11, [Online: web] Accessed on 1 November 2012 URL: http://www.idsa.in/system/files/IB_ChinasBMDCapability.pdf

Kumar, Neha (2008b), "Enhancing the United States First Strick Capability With the Development of Ballistic Missile defence", *World Affairs*, 12, (3) :71-82.

Kumar, Neha (2009c), "Engaging China's Nuclear and Missile Threat**",** *India Quarterly: A Journal of International Affairs,* 65(1): 37-53.

Lebovic, H, James (2002), "The Law of Small Numbers: Deterrence and National Missile Defense", *Journal of Conflict Resolution*, 46, (4): 455-483.

Lee, William T. (2000), "The ABM treaty was dead on arrival, Comparative Missile Defense', *International Security* 27(4): 86–118.

Lewis, George et al. (1999-2000), "National Missile Defense: An Indefensible System", *Foreign Policy,* (117)120-137.

Lewis, George N. and Postol, Theodore A. (2010), "How US strategic anti-missile Defense could be made to work", *Bulletin of the Atomic Scientists*, 66(6): 8–24.

Lewis, John Wilson and Di, Hua (1992), "China's Ballistic Missile Programs: Technologies, Strategies, Goals", *International Security,* 17(2): 5-40.

Lipin, Michael (2012), "Israel's Iron Dome Missile Shield", *Voice of America*, Middle East, 20 November, 2012.

Lodal, Jan (2001), "Pledging 'No First Strike': A Step toward Real WMD Cooperation" Washington, D.C.: Arms Control Today, [Online: web] Accessed on 30 May 2012 URL: http://www.armscontrol.org/print/812

Lyon, Rod and Dellit, David (2010), "Ballistic Missile Defence: An Australian perspective", *Australian Journal of International Affairs'*, 55(3): 445-451.

Macdonald, Gordon et al. (1981), "Soviet Strategic Air Defense" in Richard K. Betts (eds.) *Cruise Missiles: Technology, Strategy and Politics,* Washington D.C: The Brookings Institution.

Matsumura, Masahiro (1998), "Deploying Theatre Missile Defense Flexibly", *Defense Analysis*, 14(2):157-167.

McCarthy, Timothy V. (1994), "India: Emerging Missile Power" in William C. Potter and Harlan W. Jencks (eds.) *The International Missile Bazaar: The New Suppliers' Network*, Oxford: Westview Press, Inc.

Mian, Z. et al. (1998), "Bringing Prithvi down to Earth: The Capabilities and Potential effectiveness of India's Prithvi Missile", *Science & Global Security: The Technical Basis for Arms Control, Disarmament, and Non-proliferation Initiatives,* 7(3): 333-360.

*Missile Defense Agency (2010), US Department of Defense, Missile Defense Agency, "PATRIOT Advanced Capability-3", Fort Belvoir, Virginia: Missile Defense

Agency, [Online: web] Accessed on 15 July, 2012 URL: http://www.mda.mil/global/documents/pdf/pac3.pdf

*Missile Defense Agency, (2007) US Department of Defense, Missile Defense Agency, "Ballistic Missile Defense System (BMDS): Programmatic Environmental Impact Statement", Washington, DC: Missile Defense Agency, Vol. 2, [Online: web] Accessed on 28 November 2012, URL http://www.mda.mil/global/documents/pdf/env_bmds_peis_vol2.pdf

Missile Threat (2012), "S-300P(SA-10 GRUMBL)", A Project of the George C. Marshall and Claremont Institutes, Kent Street, Arlington: the George C. Marshall and Claremont Institutes, [Online: web] Accessed on 24 Nov., 2012, URL: http://missilethreat.com/defense-systems/s-300p-sa-10-grumble/

Mohan, C. Raja (1986a) 'The Tragedy of Nuclear Deterrence' *Social Scientist*, 14(4): 3-19.

Mohan, C. Raja (2012b), "The New Triangular Diplomacy: India, China and America at Sea", *The Diplomat*, Tokyo, 5 November 2012. [Online: web] Accessed on 27 November 2012, URL:http://thediplomat.com/2012/11/05/the-new-triangular-diplomacy-india-china-and-america-on-the-high-seas/

Moore, John Norton et al. (1986), "Strategic Arms Limitation: Treaty Obligations and the Strategic Defense Initiative", *American Society of International Law*, 80: 73- 95.

Mostly Missile Defense (August 24, 2012), "Ballistic Missile Defense: Comparing the Current GMD National Missile Defense (NMD) System to the Clinton Administration's Proposed NMD System", [Online: web] Accessed on 30 Jun 2012, URL:http://mostlymissiledefense.com/2012/08/24/ballistic-missile-defense-comparing-the-current-gmd-national-missile-defense-nmd-system-to-the-clinton-adminstrations-proposed-nmd-system-august-24-2012/

Mullerson, Rein (2001), "The ABM Treaty: Changed Circumstances, Extraordinary Events, Supreme Interests and International Law", *The International and Comparative Law Quarterly,* 50(3): 509-539.

NDTV (2012), "Missiles of the world: A look at countries' arsenals", New Delhi: Indo-Asian News Service, April 19, 2012 [Online: web] Accessed on 30 June 2012, URL: http://www.ndtv.com/article/world/missiles-of-the-world-a-look-at-countries-arsenals-199733

Newhouse, John (2001), 'The Missile Defense Debate', *Foreign Affairs*, 80(4):97-109.

NTI, Nuclear Threat Initiative (2012), "India Missile Chronology", Monterey, California: the James Martin Center for Nonproliferation Studies , [Online: web] Accessed on 29 November 2012 URL: http://www.nti.org/media/pdfs/india_missile_3.pdf?_=1339452308

Nufeld, Jacob (1990), *The Development of Ballistic Missiles in the U.S Air Force 1945-1960,* Washington, DC: Office of Air Force History United States Air Force.

O' Halloran, James C and Christopher F, Foss, eds., (2010), *Jane's Land- Based Air Defence 2010-2011*, Coulsdon, Surrey: IHS Jane's, IHS (Global) Limited.

*O' Rourke, Ronald (2010), "Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress", Report to the Members and Committees of Congress by the Congressional Research Service, 7-5700, 1-48.

Obe, Duncan Lennox (2011), *Janes's Strategic Weapon systems*: Issue 55, July 2011 Coulsdon, Surrey: IHS Jane's, IHS (Global) Limited.

O'Connor, Sean (2012), "Russia/Soviet Anti-Ballistic Missile System", Technical Report Air Power Australia (APA), TR-2009-1203, [Online: web] Accessed on 20 August 2012 URL: http://www.ausairpower.net/APA-Rus-ABM-Systems.html

*OTA, Office of Technology Assessment, (1986), "Strategic Defenses: Ballistic Missile Defense Technologies Anti-Satellite Weapons, Countermeasures and Arms Control", Report by the United States Congress Office of Technology Assessment, Princeton, New Jersey: Princeton University Press.

Palmore, Julian (2003), "US ballistic missile Defense and China", *Defense & Security Analysis,* 19 (4): 369-375.

Pant, Harsh V. (2005), "India Debates Missile Defense", *Defence Studies*, 5 (2): 228-246.

Papp, Denial S. (1987-88), "From Project Thumper to SDI: The Role of Ballistic Missile Defense in US Security Policy", *Airpower Journal*, [Online: web], Accessed on 22 February 2012, URL: http://www.airpower.maxwell.af.mil/airchronicles/apj/apj87/win87/papp.html

Paul, T.V. et al, (eds.), (2009), *Complex Deterrence: Strategy in the Global Age*, New Delhi, Cambridge University Press India Ltd.

Paulson, Heidi A. (2009), "Toward a New 'New Triad", A Research Report Submitted to the Faculty in Partial Fulfillment of the Graduation Requirements, Maxwell Air Force Base, Alabama: Air Command and Staff College Air University.

Payne B. Keith (2011), "Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence", *Strategic Studies Quarterly,* 5, (2):13-29.

Payne, Keith B. (2000), "The Case for a National Missile Defense", Georgetown: National Institute for Public Policy, 1-20, [Online: web] Accessed on 12 November 2012, URL: http://www.nipp.org/National%20Institute%20Press/Archives/Publication%20Archive%20PDF/Orbis%20.pdf

Peoples, Columba (2008b), "Decoding Ballistic Missile Defense: Semiotics and the Power of the Image in American Ballistic Missile Defense", *Social Semiotics*, 18 (1): 17-31.

Peoples, Columba (2010a), *Justifying Ballistic Missile Defense: Technology, Security and Culture*, Cambridge: Cambridge University Press.

Preble, Christopher (2005), "The Bush Doctrine and "Rogue" State'", *Foreign Service,* pp. 25-30, [Online: web] Accessed on May 6, 2012 http://www.cato.org/pubs/articles/preble_afsa_bush_doctrine_rogue_states.pdf

Rajagopalan, Rajesh (2004a), "Missile Defences in South Asia: Much Ado about Nothing", *South Asian Survey*, 11, (2):205-216.

Raffier, John P. (1996), *Ballistic Missile Defense and NATO Alliance Relations*, Master Thesis, Monterey, California: Naval Postgraduate School.

Rajagopalan, Rajesh (2005b), *Second Strike Arguments about Nuclear War in South Asia*, New Delhi: Penguin Group.

Rance, Michal (2001), "Technological Aspects of Ballistic Missile Defence', in CNS Occasional paper no.7 on Missile Proliferation and Defences: Problems and Prospects, Monterey: James Martin Centre for Non- Proliferation Studies [Online: web] Accessed on 30 May, 2012 URL: http://www.mcis.soton.ac.uk/publications/missile_proliferation.pdf

Randy, Strock (2012), "Shipboard Testing of the SPY-1 RADAR", *Leading Edge*, 7 (2) 84-99, [Online: web] Accessed on 18 November 2012, URL: http://www.navsea.navy.mil/nswc/dahlgren/Leading%20Edge/Sensors/04_Testing.pdf

Raytheon (2003-2006), "Patriot Combat-Proven Air and Missile Defense", Raytheon Company: Integrated Defense Systems, Tewksbury, Massachusetts. USA, [Online: web] Accessed on 24 June, 2012 URL: http://www.raytheon.com/businesses/stellent/groups/public/documents/legacy_site/cms01_048575.pdf

Rhinelander, John B. (2001), "The ABM treaty: Past, Present and Future'', *Journal of Conflict and Security Law*, 6(1): 91-114.

Riper, A. Bowdoin Van (2004), *Rockets and Missiles: the Life Story of a Technology*, London: Greenwood Press.

Riqiang, Wu (2011), "Survivability of China's Sea-Based Nuclear Forces", *Science & Global Security: the Technical Basis for Arms Control, Disarmament, and Non-proliferation Initiatives,* 19(2) 91-120**.**

Rix, Damian, Mark, (1997), *Discipline and Threatened punishment: a Theory of Nuclear Deterrence and the Discipline of Strategic Studies, 1946-1960*, PhD Thesis, university Wollongong.

Roberts, Brad (2003), "China and Ballistic Missile Defense: 1955 to 2002 and Beyond", Alexandria, Virginia: IDSA, Institute for Defense Analysis (3826):1-47.

Rosenberg, Max (1960), "*Plan and Policies for the Ballistic Missile Initial Operational Capability Program",* Washington, D.C.: USAF Historical division Liaison Office, [Online: web] Accessed on 6 May 2012 URL: http://www.afhso.af.mil/shared/media/document/AFD-110321-028.pdf

Rose, Frank A. (2012), "Missile Defense and European Security", Lecture delivered on 3 July, 2005 at Paris, France on 8th International Conference on Missile Defence) http://www.state.gov/t/avc/rls/194453.htm#

Russell, L. Richard (2002), "Swords and Shields: Ballistic Missile and Defences in the Middle East and South Asia", *Elsevier Science Limited,* pp.483-498.

Rusten, Lynn F. (2010), "U.S. Withdrawal from Anti-ballistic Missile Treaty" in Jeffrey A. Larsen and Erin R. Mahan (eds.) *Case Study Series,* Washington, D.C:

National Defense University Press, [Online: web], Accessed on 22 February 2012, URL: http://www.ndu.edu/press/lib/images/occasionalPapers/cswmd-cs2.pdf

Sahgal, Arun (2012), " India and US Rebalancing Strategy for Asia-Pacific", New Delhi: The Institute for Defence Studies and Analyses (IDSA), 9 July, 2012, [Online: web] Accessed on 27 October 2012 URL: http://www.idsa.in/idsacomments/IndiaandUSRebalancingStrategyforAsiaPacific_asahgal_090712

Schaffer, Marvin (2012), 'Moral Nuclear Deterrence - the Ascendancy of Missile Defense', *Foresight*, 14(3):260 – 271.

Scheneider, William (1969), "Missile Defense System: Past, Present and Future" in Johan J. Holst and William, Scheneider Jr. (eds.) *Why ABM? Policy Issues in the Missile Defense Controversy,* New York: Pergamon Press Inc.

Schin, F. Derek (1996) *The Impact On Strategic Stability Of Ballistic Missile Defense In Eastern Europ*e, Master Thesis, B.S., United States Air Force Academy, Colorado Springs, Colorado.

Schmidt, Oliver (2008), "Assessing the reasons for a US Ballistic Missile Defence: An assessment of the current ballistic missile threat to the United States and the US policy under the Presidency of George W. Bush", Dusseldorf, Germany: Dusseldorf Institute for Foreign and Security Policy, (35):1-13, [Online: web], Accessed on 1 May 2012, URL: http://www.dias online.org/fileadmin/templates/downloads/DIAS_Analysen/Analyse35.pdf

Sahni, Varun (2004), "India and Missile Acquisition: Push and Pull Factors", *South Asian Survey* 11(2): 287-299.

Schneider, Leo J. (1987), "Navy in the Nineties - Trend and Technology", 24th Annual Technical Symposium by the Association of Scientists and Engineers of the Naval Sea Systems Command, Washington, D.C.: Department of the Navy, AD-A183-944:1-23.

Schneiter, George (1984), "The ABM Treaty Today", in Ashton B. Carter and David N. Schwartz, eds., *Ballistic Missile Defenses,* Washington, D.C. : Brookings Institution, Massachusetts Avenue N.W.

Sessions, Jeff (2008), "Ballistic Missile Defense: A National Priority", *Strategic Studies Quarterly*, 22-30, [Online: web], Accessed on 18 January 2012, URL: http://www.au.af.mil/au/ssq/2008/Summer/sessions.pdf

Sessler et al. (2000), “Countermeasures: A Technical Evaluation of the Operational Effectiveness of the Planned US National Missile Defense System”, Union of Concerned Scientists, MIT Security Studies Program, Cambridge: Union of Concerned Scientists, 1-173, [Online: web] Accessed on 13 December 2012, URL: http://www.ucsusa.org/assets/documents/nwgs/cm_all.pdf

Shanker, Thom (2012), “Israel’s anti-missile System Attracts Potential Buyers”, *The New York Times*, Middle East, 29 November, 2012.

*Sharp, Jeremy M. (2012), “U.S. Foreign Aid to Israel Specialist in Middle Eastern Affairs”, Congressional Research Service report, Prepared for Members and Committees of Congress, Washington, DC: Congressional Research Service, 7-5700, [Online: web] Accessed on 2 November 2012, URL: http://www.fas.org/sgp/crs/mideast/RL33222.pdf

Shinichi, OGAWA (2004), " Strategic Significance of Missile Defense and Its Impact on International Security", The National Institute for Defense Studies (NIDS) Security Reports, (5) : 104-135, Nakameguro, Meguro-ku, Tokyo, Japan: NIDS.

Sherman, J. Daniel (2003), “PATRIOT PAC-2 Development and Deployment in the Gulf War”, *Acquisition Review Quarterly*, 29 -45, [Online: web] Accessed on 12 November 2012, URL:.http://www.dau.mil/pubscats/PubsCats/AR%20Journal/arq2003/ShermanWT3.pdf

Sinodefence (2009), “Project 640: China's National Missile Defence in the '70s”, 1-2, [Online: web] Accessed on 20 September 2012 URL: http://www.sinodefence.com/special/airdefence/project640.asp

Siperco, Ian (2010), “Shield of David: The Promise of Israeli National Missile Defense”, *Middle East Policy*, 17(2)127-141.

Sloss, Leon, (1984), “The Strategist’s Perspective”, in Ashton B. Carter and David N. Schwartz (eds.), *Ballistic Missile Defenses,* Washington, DC: Brookings Institution 1775 Massachusetts Avenue N.W.

Smith, D, Derek (2006), *Deterring America: Rough States and the proliferation of Weapons of Mass Destruction*, New York: Cambridge University Press.

Sofaer, Abraham D. (1986), “The ABM Treaty and the Strategic Defense Initiative”, *Harvard Law Review,* 99(8): 1972-1985.

Soofer, M, Robert, (1988), *Missile Defenses and Western European Security*, New York: Greenwood Press.

Spinardi, Graham (2007), "Golfballs on the Moor: Building the Fylingdales Ballistic Missile Early Warning System, *Contemporary British History*, 21(1): 87-110**.**

Spinardi, Graham (2009a), "Technological Controversy and US Ballistic Missile Defense: Star Warriors versus the Huntsville Mafia", *Defence Studies*, 9(3): 354-384.

Srivastava, Anupam (2000) "India's Growing Missile Ambitions: Assessing the Technical and Strategic Dimensions", *Asian Survey*, 40(2): 311-341.

Steinbruner, D., John (1987), "The Principles of Defensive Deterrence", *The Brookings Review,* 5(3): 22-28.

Subramanian, T. S (2012), "Real Time Trial of Interceptor and Simulated Missiles" *The Hindu*, Chennai, November 22, 2012, [Online: web] Accessed on 30 November 2012, URL: http://www.thehindu.com/sci-tech/technology/real-time-trial-of-interceptor-and-simulated-missiles/article4122348.ec

Tellis, Ashley J. (2006), "The Evolution of U.S.-Indian Ties: Missile Defense in an Emerging Strategic Relationship", *International Security*, 30 (4): 113-151.

The Adelphi Papers (2000a), "National missile defence", 40 (334): 29-44. [Online: web] Accessed 1 March 2012, URL: http://www.tandfonline.com/doi/pdf/10.1080/05679320008457634

The Adelphi Papers (2000b), "Theatre-missile defence", 40 (334): 45-58 [Online: web] Accessed on 13 December 2012, URL: http://www.tandfonline.com/doi/pdf/10.1080/05679320008457635

The Military Balance (2011), "Chapter Six: Asia", 111(1): 195-292, [Online: web] Accessed on 18 November 2012 URL: http://www.tandfonline.com/doi/pdf/10.1080/04597222.2011.559837

Toms, Kevin E. (2008), *NATO and U.S. Ballistic Missile Defense Programs: Divergent or Convergent Paths?* Master's Thesis, Missouri: Missouri Western State University.

Topychkanov, Petr (2012), "India's Prospects in the Area of Ballistic Missile Defense: a Regional Security Perspective", Moscow, Tverskaya ul: Carnegie Moscow Center, (3), [Online: web] Accessed on 5 December 2012, URL: http://carnegieendowment.org/files/WP3_2012_Topychkanov_en.pdf

Torbati, Yeganeh (2012), "Iran Threatens Israel: New EU Sanctions Take Force", [Online: web]Accessed on 27 September 2012, URL: http://www.reuters.com/article/2012/07/01/us-iran-idUSBRE8600HG20120701

Tsypkin, Mikhail (2012), "Russia, America and Missile Defense" *Defense & Security Analysis*, 28(1): 55-64.

Weiner, Stephen (1984), "Systems and Technology", in Ashton B. Carter and David N. Schwartz (eds.), *Ballistic Missile Defenses,* Washington, D.C.: Brookings Institution 1775 Massachusetts Avenue N.W.

Wilkening, Dean A. (2004), "Airborne Boost-Phase Ballistic Missile Defense", *Science & Global Security*, 12: 1-67.

Wirtz, J. James and Russell, A. James (2006), "United States Nuclear Strategy in the Twenty-First Century", in Ian R. Kenyon and John Simpson (eds.), *Deterrence and new Global Security Environment,* Abingdon: Rutledge Taylor & Francis Group.

Wood, Kevin et al. (2005), "A Two-Sided Optimization for Theater Ballistic Missile Defense", *Operations Research*, 53(5): 745-763.

Wood, Rhys (2010), *Missile Defence and the Deterioration of the Russian-American Relationship,* B.A Thesis, Adelaide, Whyalla and Mount Gambier, South Australia: Australia, University of South Australia.

Yanarella, Ernest J. (2002), *The Missile Defense Controversy: Technology in Search of a Mission,* Lexington, Kentucky: The University Press of Kentucky.

Yom, Sean L. (2008), "Washington's New Arms Bazaar", *Middle East Report*, (246): 22-31.

Yong, Qiu and Yingbo, (2003), "THAAD-Like High Altitude Theater Missile Defense: Strategic Defense Capability and Certain Countermeasures Analysis*",* *Science and Global Security,* 1(2-3) 151–202.

Yost, David S. (1988), *Soviet Ballistic Missile Defense and the Western Alliance*, Cambridge: Harvard University Press.

Youngs, Tim and Taylor, Claire (2003), "Ballistic Missile Defence", London: House Of Commons Library, Research Paper, 03/28, [Online: web] Accessed on 20 November 2012 URL: http://www.parliament.uk/documents/commons/lib/research/rp2003/rp03-028.pdf

Zeijden, Van Der Wilbert (2007), *The Essence Ballistic Missile Defense: A Three Level Analysis of the US Decision to Develop and Deploy Ballistic Missile Defense*, Master Thesis, Amsterdam, Netherlands: The Vrije Universiteit.

ANNEXURE 1

PROVISIONS OF THE 1972 ANTI-BALLISTIC MISSILE TREATY

Article I

1. Each Party undertakes to limit anti-ballistic missile (ABM) systems and to adopt other measures in accordance with the provisions of this Treaty.

2. Each Party undertakes not to deploy ABM systems for a defense of the territory of its country and not to provide a base for such a defense, and not to deploy ABM systems for defense of an individual region except as provided for in Article III of this Treaty.

Article II

1. For the purpose of this Treaty an ABM system is a system to counter strategic ballistic missiles or their elements in flight trajectory, currently consisting of:

(a) ABM interceptor missiles, which are interceptor missiles constructed and deployed for an ABM role, or of a type tested in an ABM mode;

(b) ABM launchers, which are launchers constructed and deployed for launching ABM interceptor missiles; and

(c) ABM radars, which are radars constructed and deployed for an ABM role, or of a type tested in an ABM mode.

2. The ABM system components listed in paragraph 1 of this Article include those which are:

(a) Operational;

(b) Under construction;

(c) Undergoing testing;

(d) Undergoing overhaul, repair or conversion; or

(e) Mothballed.

Article III

Each Party undertakes not to deploy ABM systems or their components except that:

(a) Within one ABM system deployment area having a radius of one hundred and fifty kilometers and centered on the Party's national capital, a Party may deploy:

(1) No more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites, and

(2) ABM radars within no more than six ABM radar complexes, the area of each complex being circular and having a diameter of no more than three kilometers; and

(b) Within one ABM system deployment area having a radius of one hundred and fifty kilometers and containing ICBM silo launchers, a Party may deploy:

(1) No more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites,

(2) Two large phased-array ABM radars comparable in potential to corresponding ABM radars operational or under construction on the date of signature of the Treaty in an ABM system deployment area containing ICBM silo launchers, and

(3) No more than eighteen ABM radars each having a potential less than the potential of the smaller of the above-mentioned two large phased-array ABM radars.

Article IV

The limitations provided for in Article III shall not apply to ABM systems or their components used for development or testing, and located within current or additionally agreed test ranges. Each Party may have no more than a total of fifteen ABM launchers at test ranges.

Article V

1. Each Party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based.

> 2. Each Party undertakes not to develop, test or deploy ABM launchers for launching more than one ABM interceptor missile at a time from each launcher, not to modify deployed launchers to provide them with such a capacity, not to develop, test, or deploy automatic or semi-automatic or other similar systems for rapid reload of ABM launchers.

Article VI

To enhance assurance of the effectiveness of the limitations on ABM systems and their components provided by the Treaty, each Party undertakes:

(a) Not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode; and

(b) Not to deploy in the future radars for early warning of strategic ballistic missile attack except at locations along the periphery of its national territory and oriented outward.

Article VII

Subject to the provisions of this Treaty, modernization and replacement of ABM systems or their components may be carried out.

Article VIII

ABM systems or their components in excess of the numbers or outside the areas specified in this Treaty, as well as ABM systems or their components prohibited by this Treaty, shall be destroyed or dismantled under agreed procedures within the shortest possible agreed period of time.

Article IX

To assure the viability and effectiveness of this Treaty, each Party undertakes not to transfer to other States, and not to deploy outside its national territory, ABM systems or their components limited by this Treaty.

Article X

Each Party undertakes not to assume any international obligations which would conflict with this Treaty.

Article XI

The Parties undertake to continue active negotiations for limitations on strategic offensive arms.

Article XII

1. For the purpose of providing assurance or compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.

2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.

3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty. This obligation shall not require changes in current construction, assembly, conversion, or overhaul practices.

Article XIII

1. To promote the objectives and implementation of the provisions of this Treaty, the Parties shall establish promptly a Standing Consultative Commission, within the framework of which they will:

(a) Consider questions concerning compliance with the obligations assumed and related situations which may be considered ambiguous;

(b) Provide on a voluntary basis such information as either Party considers necessary to assure confidence in compliance with the obligations assumed;

(c) Consider questions involving unintended interference with national technical means of verification;

(d) Consider possible changes in the strategic situation which have a bearing on the provisions of this Treaty;

(e) Agree upon procedures and dates for destruction or dismantling of ABM systems or their components in cases provided for by the provisions of this Treaty;

(f) Consider, as appropriate, possible proposals for further increasing the viability of this Treaty; including proposals for amendments in accordance with the provisions of this Treaty;

(g) Consider, as appropriate, proposals for further measures aimed at limiting strategic arms.

2. The Parties through consultation shall establish, and may amend as appropriate, Regulations for the Standing Consultative Commission governing procedures, composition and other relevant matters.

Article XIV

1. Each Party may propose amendments to this Treaty. Agreed amendments shall enter into force in accordance with the procedures governing the entry into force of this Treaty.

2. Five years after entry into force of this Treaty, and at five-year intervals thereafter, the Parties shall together conduct a review of this Treaty.

Article XV

1. This Treaty shall be of unlimited duration.

2. Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests. It shall give notice of its

decision to the other Party six months prior to withdrawal from the Treaty. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests.

Article XVI

1. This Treaty shall be subject to ratification in accordance with the constitutional procedures of each Party. The Treaty shall enter into force on the day of the exchange of instruments of ratification.

2. This Treaty shall be registered pursuant to Article 102 of the Charter of the United Nations.

Source: [Online: web] URL: http://www.fas.org/nuke/control/abmt/text/index.html

ANNEXURE 2

PRESIDENT RONALD REAGAN LAND MARK SPEECH ON MARCH 23, 1983

The calls for cutting back the defense budget come in nice, simple arithmetic. They're the same kind of talk that led the democracies to neglect their defenses in the 1930's and invited the tragedy of World War II. We must not let that grim chapter of history repeat itself through apathy or neglect.

This is why I'm speaking to you tonight--to urge you to tell your Senators and Congressmen that you know we must continue to restore our military strength. If we stop in midstream, we will send a signal of decline, of lessened will, to friends and adversaries alike. Free people must voluntarily, through open debate and democratic means, meet the challenge that totalitarians pose by compulsion. It's up to us, in our time, to choose and choose wisely between the hard but necessary task of preserving peace and freedom and the temptation to ignore our duty and blindly hope for the best while the enemies of freedom grow stronger day by day.

The solution is well within our grasp. But to reach it, there is simply no alternative but to continue this year, in this budget, to provide the resources we need to preserve the peace and guarantee our freedom.

Now, thus far tonight I've shared with you my thoughts on the problems of national security we must face together. My predecessors in the Oval Office have appeared before you on other occasions to describe the threat posed by Soviet power and have proposed steps to address that threat. But since the advent of nuclear weapons, those steps have been increasingly directed toward deterrence of aggression through the promise of retaliation.

This approach to stability through offensive threat has worked. We and our allies have succeeded in preventing nuclear war for more than three decades. In recent months, however, my advisers, including in particular the Joint Chiefs of Staff, have underscored the necessity to break out of a future that relies solely on offensive retaliation for our security.

Over the course of these discussions, I've become more and more deeply convinced that the human spirit must be capable of rising above dealing with other nations and human beings by threatening their existence. Feeling this way, I believe we must thoroughly examine every opportunity for reducing tensions and for introducing greater stability into the strategic calculus on both sides.

One of the most important contributions we can make is, of course, to lower the level of all arms, and particularly nuclear arms. We're engaged right now in several negotiations with the Soviet Union to bring about a mutual reduction of weapons. I will report to you a week from tomorrow my thoughts on that score. But let me just say, I'm totally committed to this course.

If the Soviet Union will join with us in our effort to achieve major arms reduction, we will have succeeded in stabilizing the nuclear balance. Nevertheless, it will still be necessary to rely on the specter of retaliation, on mutual threat. And that's a sad commentary on the human condition. Wouldn't it be better to save lives than to avenge them? Are we not capable of demonstrating our peaceful intentions by applying all our abilities and our ingenuity to achieving a truly lasting stability? I think we are. Indeed, we must.

After careful consultation with my advisers, including the Joint Chiefs of Staff, I believe there is a way. Let me share with you a vision of the future which offers hope. It is that we embark on a program to counter the awesome Soviet missile threat with measures that are defensive. Let us turn to the very strengths in technology that spawned our great industrial base and that have given us the quality of life we enjoy today.

What if free people could live secure in the knowledge that their security did not rest upon the threat of instant U.S. retaliation to deter a Soviet attack, that we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our allies?

I know this is a formidable, technical task, one that may not be accomplished before the end of this century.

Yet, current technology has attained a level of sophistication where it's reasonable for us to begin this effort. It will take years, probably decades of effort on many fronts. There will be failures and setbacks, just as there will be successes and breakthroughs. And as we proceed, we must remain constant in preserving the nuclear deterrent and maintaining a solid capability for flexible response. But isn't it worth every investment necessary to free the world from the threat of nuclear war? We know it is.

In the meantime, we will continue to pursue real reductions in nuclear arms, negotiating from a position of strength that can be ensured only by modernizing our strategic forces. At the same time, we must take steps to reduce the risk of a conventional military conflict escalating to nuclear war by improving our nonnuclear capabilities.

America does possess--now--the technologies to attain very significant improvements in the effectiveness of our conventional, nonnuclear forces. Proceeding boldly with these new technologies, we can significantly reduce any incentive that the Soviet Union may have to threaten attack against the United States or its allies.

As we pursue our goal of defensive technologies, we recognize that our allies rely upon our strategic offensive power to deter attacks against them. Their vital interests and ours are inextricably linked. Their safety and ours are one. And no change in technology can or will alter that reality. We must and shall continue to honor our commitments.

I clearly recognize that defensive systems have limitations and raise certain problems and ambiguities. If paired with offensive systems, they can be viewed as fostering an aggressive policy, and no one wants that. But with these considerations firmly in mind, I call upon the scientific community in our country, those who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete.

Tonight, consistent with our obligations of the ABM treaty and recognizing the need for closer consultation with our allies, I'm taking an important first step. I am directing a comprehensive and intensive effort to define a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles. This could pave the way for arms control measures to eliminate the weapons themselves. We seek neither military superiority nor political advantage. Our only purpose-one all people share-is to search for ways to reduce the danger of nuclear war.

My fellow Americans, tonight we're launching an effort which holds the promise of changing the course of human history. There will be risks, and results take time. But I believe we can do it. As we cross this threshold, I ask for your prayers and your support.

Thank you, good night, and God bless you.

Source: [Online: web] URL: http://www.fas.org/spp/starwars/offdocs/rrspch.htm

ANNEXURE 3

PRESIDENT GEORGE W. BUSH'S SPEECH ON MAY 1, 2001 AT NATIONAL MISSILE DEFENSE UNIVERSITY, WASHINGTON, D.C.

Thank you very much, Mr. Secretary. I appreciate you being here. I also want to thank Secretary Powell for being here as well. My National Security Advisor, Condi Rice is here, as well as the Vice Chairman of the Joint Chiefs, General Myers. I appreciate Admiral Clark and General Ryan here, for being here as well. But most of all, I want to thank you, Admiral Gaffney, and the students for NDU for having me here today.

For almost 100 years, this campus has served as one of our country's premier centers for learning and thinking about America's national security. Some of America's finest soldiers have studied here: Dwight Eisenhower and Colin Powell. Some of America's finest statesmen have taught here; George Kennan. Today, you're carrying on this proud tradition forward, continuing to train tomorrow's generals, admirals and other national security thinkers, and continuing to provide the intellectual capital for our nation's strategic vision.

This afternoon, I want us to thank back some 30 years to a far different time in a far different world. The United States and the Soviet Union were locked in a hostile rivalry. The Soviet Union was our unquestioned enemy; a highly-armed threat to freedom and democracy. Far more than that wall in Berlin divided us.

Our highest ideal was -- and remains -- individual liberty. Theirs was the construction of a vast communist empire. Their totalitarian regime held much of Europe captive behind an iron curtain.

We didn't trust them, and for good reason. Our deep differences were expressed in a dangerous military confrontation that resulted in thousands of nuclear weapons pointed at each other on hair-trigger alert. Security of both the United States and the Soviet Union was based on a grim premise: that neither side would fire nuclear weapons at each other, because doing so would mean the end of both nations.

We even went so far as to codify this relationship in a 1972 ABM Treaty, based on the doctrine that our very survival would best be insured by leaving both sides completely open and vulnerable to nuclear attack. The threat was real and vivid. The Strategic Air Command had an airborne command post called the Looking Glass, aloft 24 hours a day, ready in case the President ordered our strategic forces to move toward their targets and release their nuclear ordnance.

The Soviet Union had almost 1.5 million troops deep in the heart of Europe, in Poland and Czechoslovakia, Hungary and East Germany. We used our nuclear weapons not just to prevent the Soviet Union from using their nuclear weapons, but also to contain their conventional military forces, to prevent them from extending the Iron Curtain into parts of Europe and Asia that were still free.

In that world, few other nations had nuclear weapons and most of those who did were responsible allies, such as Britain and France. We worried about the proliferation of nuclear weapons to other countries, but it was mostly a distant threat, not yet a reality.

Today, the sun comes up on a vastly different world. The Wall is gone, and so is the Soviet Union. Today's Russia is not yesterday's Soviet Union. Its government is no longer Communist. Its president is elected. Today's Russia is not our enemy, but a country in transition with an opportunity to emerge as a great nation, democratic, at peace with itself and its neighbors. The Iron Curtain no longer exists. Poland, Hungary and the Czech Republic are free nations, and they are now our allies in NATO, together with a reunited Germany.

Yet, this is still a dangerous world, a less certain, a less predictable one. More nations have nuclear weapons and still more have nuclear aspirations. Many have chemical and biological weapons. Some already have developed the ballistic missile technology that would allow them to deliver weapons of mass destruction at long distances and at incredible speeds. And a number of these countries are spreading these technologies around the world.

Most troubling of all, the list of these countries includes some of the world's least-responsible states. Unlike the Cold War, today's most urgent threat stems not from thousands of ballistic missiles in the Soviet hands, but from a small number of missiles in the hands of these states, states for whom terror and blackmail are a way of life. They seek weapons of mass destruction to intimidate their neighbors, and to keep the United States and other responsible nations from helping allies and friends in strategic parts of the world.

When Saddam Hussein invaded Kuwait in 1990, the world joined forces to turn him back. But the international community would have faced a very different situation had Hussein been able to blackmail with nuclear weapons. Like Saddam Hussein, some of today's tyrants are gripped by an implacable hatred of the United States of America. They hate our friends, they hate our values, they hate democracy and freedom and individual liberty. Many care little for the lives of their own people. In such a world, Cold War deterrence is no longer enough.

To maintain peace, to protect our own citizens and our own allies and friends, we must seek security based on more than the grim premise that we can destroy those who seek to destroy us. This is an important opportunity for the world to re-think the unthinkable, and to find new ways to keep the peace.

Today's world requires a new policy, a broad strategy of active nonproliferation, counter-proliferation and defenses. We must work together with other like-minded nations to deny weapons of terror from those seeking to acquire them. We must work with allies and friends who wish to join with us to defend against the harm they can inflict. And together we must deter anyone who would contemplate their use.

We need new concepts of deterrence that rely on both offensive and defensive forces. Deterrence can no longer be based solely on the threat of nuclear retaliation. Defenses can strengthen deterrence by reducing the incentive for proliferation.

We need a new framework that allows us to build missile defenses to counter the different threats of today's world. To do so, we must move beyond the constraints of the 30 year old ABM Treaty. This treaty does not recognize the present, or point us to the future. It enshrines the past. No treaty that prevents us from addressing today's threats, that prohibits us from pursuing promising technology to defend ourselves, our friends and our allies is in our interests or in the interests of world peace.

This new framework must encourage still further cuts in nuclear weapons. Nuclear weapons still have a vital role to play in our security and that of our allies. We can, and will, change the size, the composition, the character of our nuclear forces in a way that reflects the reality that the Cold War is over.

I am committed to achieving a credible deterrent with the lowest-possible number of nuclear weapons consistent with our national security needs, including our obligations to our allies. My goal is to move quickly to reduce nuclear forces. The United States will lead by example to achieve our interests and the interests for peace in the world.

Several months ago, I asked Secretary of Defense Rumsfeld to examine all available technologies and basing modes for effective missile defenses that could protect the United States, our deployed forces, our friends and our allies. The Secretary has explored a number of complementary and innovative approaches.

The Secretary has identified near-term options that could allow us to deploy an initial capability against limited threats. In some cases, we can draw on already established technologies that might involve land-based and sea-based capabilities to intercept missiles in mid-course or after they re-enter the atmosphere. We also recognize the substantial advantages of intercepting missiles early in their flight, especially in the boost phase.

The preliminary work has produced some promising options for advanced sensors and interceptors that may provide this capability. If based at sea or on aircraft, such approaches could provide limited, but effective, defenses.

We have more work to do to determine the final form the defenses might take. We will explore all these options further. We recognize the technological difficulties we face and we look forward to the challenge. Our nation will assign the best people to this critical task.

We will evaluate what works and what does not. We know that some approaches will not work. We also know that we will be able to build on our successes. When ready, and working with Congress, we will deploy missile defenses to strengthen global security and stability.

I've made it clear from the very beginning that I would consult closely on the important subject with our friends and allies who are also threatened by missiles and weapons of mass destruction.

Today, I'm announcing the dispatch of high-level representatives to Allied capital's in Europe, Asia, Australia and Canada to discuss our common responsibility to create a new framework for security and stability that reflects the world of today. They will begin leaving next week.

The delegations will be headed by three men on this stage: Rich Armitage, Paul Wolfowitz, and Steve Hadley; Deputies of the State Department, the Defense Department and the National Security staff. Their trips will be part of an ongoing process of consultation, involving many people and many levels of government, including my Cabinet Secretaries.

These will be real consultations. We are not presenting our friends and allies with unilateral decisions already made. We look forward to hearing their views, the views of our friends, and to take them into account.

We will seek their input on all the issues surrounding the new strategic environment. We'll also need to reach out to other interested states, including China and Russia. Russia and the United States should work together to develop a new foundation for world peace and security in the 21st century. We should leave behind the constraints of an ABM Treaty that perpetuates a relationship based on distrust and mutual vulnerability. This Treaty ignores the fundamental breakthroughs in technology during the last 30 years. It prohibits us from exploring all options for defending against the threats that face us, our allies and other countries.

That's why we should work together to replace this Treaty with a new framework that reflects a clear and clean break from the past, and especially from the adversarial legacy of the Cold War. This new cooperative relationship should look to the future, not to the past. It should be reassuring, rather than threatening. It should be premised on openness, mutual confidence and real opportunities for cooperation, including the area of missile defense. It should allow us to share information so that each nation can improve its early warning capability, and its capability to defend its people and territory. And perhaps one day, we can even cooperate in a joint defense.

I want to complete the work of changing our relationship from one based on a nuclear balance of terror, to one based on common responsibilities and common interests. We may have areas of difference with Russia, but we are not and must not be strategic adversaries. Russia and America both face new threats to security. Together, we can address today's threats and pursue today's opportunities. We can explore technologies that have the potential to make us all safer.

This is a time for vision; a time for a new way of thinking; a time for bold leadership. The Looking Glass no longer stands its 24-hour-day vigil. We must all look at the world in a new, realistic way, to preserve peace for generations to come.

God bless.

Source:[Online:web]URL:http://www.johnstonsarchive.net/nuclear/presidentnmd.html