DETERRENCE BY DENIAL: THE EFFICACY OF U.S. MISSILE DEFENSE IN THE PERSIAN GULF AS A DETERRENT AGAINST THE IRANIAN REGIONAL MISSILE THREAT

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by

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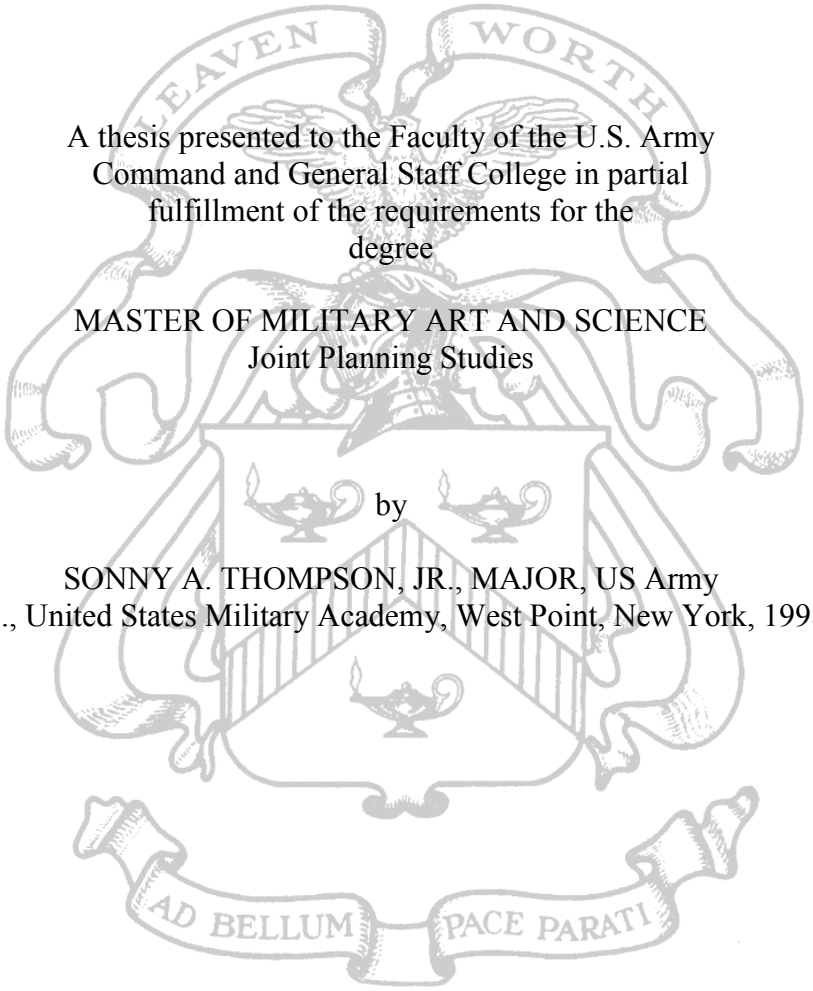

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The United States has significantly increased the deployment of missile defense systems, specifically Patriot and Aegis Ballistic Missile Defense (Aegis-BMD), to the Persian Gulf over the past six years. The increase from no missile defense assets in 2005 to two Patriot battalions spread across four Gulf Cooperation Council (GCC) countries was specifically intended for Iran. According to published Department of Defense reviews and statements from United States (U.S.) officials, the increase in forward presence is intended to deter an Iranian regional missile attack and to assure GCC partners of the U.S. resolve in the region. The purpose of this study is to assess whether or not the presence of the U.S. missile defense assets actually contributes deterrent effects against the will of Iranian leaders, to execute a necessary regional missile attack. The author investigates the credibility of the Iranian threat in terms of capability and will. He also assesses the effectiveness of U.S. missile defense assets in the region by investigating the relationship between intent of the deployment, forces allocated for this intent, and the offensive/defensive balance with the Iranian threat. Ultimately, this paper finds that U.S. missile defense assets in the Persian Gulf region, though arguably the best in the world, are not postured to strengthen conditions for deterrence.

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

DETERRENCE BY DENIAL: THE EFFICACY OF U.S. MISSILE DEFENSE IN THE PERSIAN GULF AS A DETERRENT AGAINST THE IRANIAN REGIONAL MISSILE THREAT, by MAJ Sonny A. Thompson, Jr., 100 pages.

The United States has significantly increased the deployment of missile defense systems, specifically Patriot and Aegis Ballistic Missile Defense (Aegis-BMD), to the Persian Gulf over the past six years. The increase from no missile defense assets in 2005 to two Patriot battalions spread across four Gulf Cooperation Council (GCC) countries was specifically intended for Iran. According to published Department of Defense reviews and statements from United States (U.S.) officials, the increase in forward presence is intended to deter an Iranian regional missile attack and to assure GCC partners of the U.S. resolve in the region. The purpose of this study is to assess whether or not the presence of the U.S. missile defense assets actually contributes deterrent effects against the will of Iranian leaders, to execute a necessary regional missile attack. The author investigates the credibility of the Iranian threat in terms of capability and will. He also assesses the effectiveness of U.S. missile defense assets in the region by investigating the relationship between intent of the deployment, forces allocated for this intent, and the offensive/defensive balance with the Iranian threat. Ultimately, this paper finds that U.S. missile defense assets in the Persian Gulf region, though arguably the best in the world, are not postured to strengthen conditions for deterrence.

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I dedicate this thesis to my sons Solova‘a and Christian as well as my daughter Brianna. May this serve as an example that personal achievement is possible without sacrificing the things that are truly important in life—such as family. I look forward to watching you each achieve and grow throughout a lifetime of learning.

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ACRONYMS

Aegis-BMD	Aegis Ballistic Missile Defense
BM	Ballistic Missiles
BMD	Ballistic Missile Defense
CM	Cruise Missiles
CRS	Congressional Research Service
GCC	Gulf Cooperation Council
MRBM	Medium-Range Ballistic Missiles
PAC	Patriot Advanced Capability
SRBM	Short-Range Ballistic Missiles
THAAD	Terminal High Altitude Area Defense
UAE	United Arab Emirates
U.S.	United States

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CHAPTER 1

INTRODUCTION

> 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.
>
> — U.S. Department of Defense, *Ballistic Missile Defense Review Report*

On the surface this statement seems feasible. If a potential aggressor believes his offensive capability to be physically incapable of gaining an advantage against opposing defenses, then logic supports a decision to seek alternative actions. Deeper investigation of this statement, however, presents several questions regarding the reality of creating such conditions, especially in the area of employing and defending against missiles. Do the current United States (U.S.) forward deployed missile defense systems make clear to missile armed states, such as North Korea and Iran, the impossibility of gaining an advantage through the ~~"t~~hreat" of missile attack? Considering the proliferation of relatively inexpensive ballistic missile technology and capability amongst both state and non state actors, can any missile defense system truly deter action? In general, can a defensive system ever feasibly serve as a deterrent?

Background

The threat of ballistic missile attack to U.S. forces and regional partners around the world is increasing.[1] The desire for certain state and non state actors to increase their regional status through military capability is costly, however, easier and less expensive to

[1]Department of Defense, *2010 Ballistic Missile Defense Review Report* (Washington, DC: Government Printing Office, 2011), 3.

attain through the acquisition of missiles. For those states, such as North Korea and Iran, which currently possess ballistic missile capabilities the intent to proliferate is clear, as is the intent to improve range and payload to the point of nuclear, chemical or biological armed Intercontinental Ballistic Missiles. Iran's ballistic missile capability is cause for considerable regional concern as it can currently strike any state within the Middle East.

The presence of U.S. joint missile defense systems in the Persian Gulf region has increased significantly in the last five years. Bilateral agreements with members of the Gulf Cooperation Council (GCC)[2] to improve long term joint and coalition interoperability have also increased. The United Arab Emirates (UAE) have already purchased U.S. Patriot and Terminal High Altitude Area Defense (THAAD) systems to defend their own critical assets against any potential Iranian missile attack.[3]

The allocation of low-density strategic weapon systems, such as Patriot and Aegis Ballistic Missile Defense (Aegis-BMD), to the Persian Gulf sends a potent message to Iran that U.S. commitment to its allies in the Persian Gulf is backed by all elements of national power to include a dedicated military capability. With operations in Iraq drawing down and operations in Afghanistan still in full force the enduring commitment of additional forces within the GCC is significant.

An Iranian missile attack on U.S. or regional partner assets within the Persian Gulf or broader Middle East would be devastating. Regardless of the physical damage

[2]There are six members of the GCC: Kuwait, Qatar, Bahrain, UAE, Saudi Arabia, and Oman.

[3]United Press International, "Arabs go for air power to counter Iran," *UPI.com*, 17 November 2009, http://www.upi.com/Business_News/Security-Industry/2009/11/17/Arabs-go-for-air-power-to-counter-Iran/UPI-46241258504355/ (accessed 29 January 2011).

inflicted by such an attack, the psychological effects on the regional and the U.S. populace would be significant. For the regional populace, this event would signal the beginning of a dreaded possibility, an armed conflict with the provocative regional hegemon, while for the U.S. populace, the necessary military response would increase the combat burden of a military force and economic system already stressed by 10 years of combat operations in Iraq and Afghanistan.

The U.S. ability to deter an Iranian missile attack within the Persian Gulf is one of the most critical aspects of the regional security architecture. The U.S. Department of Defense currently believes that forward deployed missile defenses strengthen deterrence by making clear to possible attackers the denial of any offensive objectives aimed against U.S. assets in the region.[4] This study seeks to analyze the efficacy of U.S. missile defense presence in the Persian Gulf as a deterrent against such an attack.

Primary Research Question

Does the presence of U.S. missile defense assets in the Persian Gulf strengthen conditions for deterrence by denial, against the Iranian missile threat?

Secondary Research Questions

What makes the Iranian missile threat to the Persian Gulf credible?

What is the role of U.S. missile defense assets in the Persian Gulf?

What indicators illustrate the effectiveness of U.S. missile defense assets as a deterrent against the Iranian missile threat?

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[4]Department of Defense, *2010 Ballistic Missile Defense Review Report*, 39.

Significance

This study is relevant to current national strategic polices regarding missile defense assets and their purpose within regional security architectures. The U.S. Department of Defense has acknowledged a growing gap between regional ballistic missile proliferation and the production of U.S. missile defense systems, the former being far greater. This study provides an alternative perspective on the current utilization of limited strategic missile defense assets. The results of this study could be used to assess an alternate and more sustainable strategy for affecting deterrent objectives in the Persian Gulf.

Assumptions

There are three main assumptions made in this study. The first assumption is that the Iranian regional missile threat is credible and perceived as such by Middle Eastern, European states and the U.S. This assumption is necessary because of the ambiguity of Iran‘s actual missile capabilities. The author discusses open source data points supporting the credibility of the Iranian missile threat despite secret and unpublished data in chapter 4.

The second assumption is that the Iranian leadership, despite provocative public rhetoric, is rational in a diplomatic and military sense. This assumption is necessary based on disparate views on Iran‘s intent to promote terror in a seemingly suicidal manner such as through the unprovoked and eventual use of nuclear capable ballistic missiles. The author discusses current and historic examples demonstrating Iranian rational decision making in chapter 4 and chapter 5.

The third assumption, following from the second, is that Iran would attack U.S. regional assets using long-range rockets, ballistic missiles, and cruise missiles only in the event of an imminent attack by U.S. or Israeli forces on the Iranian homeland. The author discusses this topic in further detail in chapter 4 when describing what makes the Iranian threat credible.

The Definition of Deterrence

The topic of deterrence is broad and spans a spectrum that covers Cold War era nuclear deterrence to present day regional deterrence. The focus of this study is not on arguing the intricacies of deterrence itself, but rather on the effect of the presence of U.S. missile defense assets in the Persian Gulf on Iran's calculus to use missiles to attack regional enemies. For the general purposes of this study the accepted U.S. military definition of deterrence suffices with the understanding that there are two major components of the term.

Deterrence is taking measures to prevent action by fear of the consequences.[5] The aim of deterrence is to get potential aggressors to believe that one or more of the following conditions exist: a credible threat of retaliation exists, the contemplated action cannot succeed, or the costs outweigh any possible gains.[6] This is the basic foundation of deterrence used in this study.

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[5]Chairman, Joint Chiefs of Staff, Joint Publication (JP) 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, 2010), 107.

[6]Chairman, Joint Chiefs of Staff, Joint Publication (JP) 3-0, *Joint Operations* (Washington, DC: Government Printing Office, 2006), vii-2.

Building on this foundational definition of deterrence there are two major components to consider: deterrence by punishment and deterrence by denial. Deterrence by punishment intuitively links itself to a credible threat of offensive retaliation. Deterrence by denial, the form of deterrence assessed in this study, refers to a defensive deterrence in which an aggressor believes that the offensive and defensive balance is such, that an offensive attack cannot succeed and therefore should be avoided.

Deterrence by denial is the form of deterrence in which forward deployed missile defense assets are intended to achieve. The author discusses the varying perspectives of deterrence theory in chapter 2 during the literature review.

Definition of Regional

In this study the term ―region" refers to a U.S. military Area of Responsibility as designated by the Unified Command Plan. There are five specific Areas of Responsibility outside of the continental U.S.: Africa Command (AFRICOM), Central Command (CENTCOM), European Command (EUCOM), Pacific Command (PACOM), and Southern Command (SOUTHCOM). Unless otherwise stated the author's regional reference focuses specifically on CENTCOM and parts of EUCOM. Figure 1 depicts the specific countries designated to each Area of Responsibility.

Figure 1. 2011 Unified Command Plan Map
Source: Department of Defense, "Unified Command Plan," http://www.defense.gov/home/features/2009/0109_unifiedcommand/ (accessed 8 May 2011).

Limitations

There are two major limitations in assessing the deterrent value of Ballistic Missile Defense (BMD) in the Persian Gulf against an Iranian missile threat. The first limitation is with the classification of true U.S. missile defense capabilities. The author discusses the joint missile defense capabilities, specifically of the U.S. Army and Navy in chapter 4, but these capabilities are discussed in terms of unclassified performance. This limitation affects the ability to compare and contrast U.S. capabilities versus Iranian capabilities in detail, but does not hinder the overall assessment of deterrent value.

The second limitation is with the availability of accurate data on the true disposition of the Iranian ballistic and cruise missile threat. The ambiguity in available data regarding Iranian capabilities, whether researching ballistic missile or nuclear technology, has been a trademark of Iranian secrecy for years. As with the first limitation, this will also prevent a detailed comparison of offensive and defensive capabilities between Iran and the U.S. respectively, but it does not prevent a valuable assessment of deterrent value from a broader perspective.

Scope and Delimitations

This study assesses the deterrent value, specifically deterrence by denial, of missile defense assets positioned in the Persian Gulf region primarily against the Iranian threat of regional surface-to-surface missile attack. The threat set includes the possibility of chemical and biological warheads delivered by short and medium range ballistic and cruise missiles. Given the proximity of GCC states to Iran and the feasibility of limited usage, long-range rockets are also included in the assessment.

The U.S.-Iranian relations referenced in this study include critical events between the 1953 Iranian *coup d'état* and 2010. Current military capabilities, historic regional critical events, and current regional politics are assessed.

As the purpose of deterrence is to affect the adversary‘s mental calculus to avoid physical action, the author focuses primarily on the psychological aspect of an Iranian missile attack within the Persian Gulf. A general investigation of Iranian surface-to-surface capabilities is conducted to establish capability, but the focus is on the will to use this capability and the ability of U.S. missile defenses to address this will.

This study does not address the possibility of a nuclear Iran, as the destructive nature of such capabilities demands a separate analysis with different parameters. Nuclear deterrence is based on the threat of nuclear retaliation, composed of mutually assured destruction and second strike capabilities. The U.S. has made clear in recent publications that the threat of nuclear retaliation will be reserved for states with nuclear capabilities.

The aim of this study is not to determine or address the general efficacy of missile defense systems as a deterrent. The scope is strictly limited to the efficacy of missile defenses as a defensive deterrent in the Persian Gulf given a credible Iranian surface-to-surface threat and a willing Iranian administration. Whether or not conditions can be met to affect true deterrence by denial in a different region can only be determined by a separate study with consideration of specific regional factors.

CHAPTER 2

LITERATURE REVIEW

Investigating the deterrent value of U.S. missile defense assets in the Persian Gulf against an Iranian regional missile attack required a literature review of three secondary topics: credibility of the Iranian missile threat, the role of U.S. missile defense in the current operating environment, and methods for identifying indicators of effectiveness. While available scholarly works on the primary research question were sparse, the availability of supporting information for the secondary questions was vast and diverse in perspective. Books, professional journal articles, newspaper articles, and internet postings are just a few of the several types of available information on each of the secondary questions.

The Iranian Threat: Capability, Will, and Regional Perceptions

In order to establish the credibility of the Iranian surface-to-surface threat to the Middle East the author examined specialized material on current Iranian capability, the will of the Iranian leadership to employ such capability, and the perception of Middle East neighbors on both Iranian capability and will. Credible material on the will of the Iranian leadership to strike regional states as well as regional opinions on this will was more readily available.

The Iranian Threat: Capability

Official reports published by the U.S. Department of Defense, Congressional Research Service (CRS), and private organizations such as the EastWest Institution and

Center for Strategic International Studies provided the most reliable data on the existing Iranian missile threat. The National Air and Space Intelligence Center at Wright-Paterson Air Force Base published an unclassified report entitled *Ballistic and Cruise Missile Threat* in 2009. This report detailed findings of known ballistic and cruise missile capability currently located in each region of the world. It identified a clear and present Iranian ballistic and anti-ship cruise missile threat of varying capabilities.

In February 2010 the U.S. Department of Defense published the first national review of the global ballistic missile threat as well as U.S. BMD policies, strategies, plans, and programs. This report, entitled *Ballistic Missile Defense Review Report,* was directed by the President of the U.S. and mandated by Congress. Two months later in April 2010 the U.S. Department of Defense published the *Nuclear Posture Review Report.* Unlike the *Ballistic Missile Defense Review Report*, the *Nuclear Posture Review Report* was not the first report of its kind, but the two reports were linked in a critical way. Both reports acknowledge the credibility and volatility of the current Iranian missile threat, conventional and eventually nuclear, to the Middle East. The reports also identify Iran along with North Korea, as two states with aspirations not only to threaten regional states with provocative rhetoric, but also the U.S. homeland.

Scholars from the CRS have published several reports on Iran‘s ballistic missile capabilities. Andrew Feichert published a CRS report to congress entitled *Iran's Ballistic Missile Capabilities* in August 2004. Steven A. Hildreth published a CRS report for Congress entitled *Iran's Ballistic Missile Programs: An Overview* in November 2007 and followed up with two subsequent updates in July of 2008 and February 2009. Kenneth Katzman published a CRS report to congress entitled *Iran: U.S. Concerns and Policy*

Responses in August 2010. Common to all of these reports are the findings that Iran possesses the ability and desire to develop, acquire, and deploy a broad range of ballistic missiles.

Credible non-governmental agencies have also provided findings based on independent studies of the Iranian missile potential. In May 2009 the EastWest Institute published a comprehensive report entitled *Iran's Nuclear and Missile Potential: A Joint Threat Assessment by U.S. and Russian Technical Experts.* In August 2009, the Center for Strategic International Studies published a very comprehensive report entitled *GCC-Iran: Operational Analysis of Air, SAM and TBM Forces.* The EastWest Institute is an international, non-partisan, nonprofit policy organization focused solely on confronting critical challenges that endanger peace. The Center for Strategic International Studies is a bipartisan, nonprofit organization that conducts research and analysis and develops policy initiatives that look into the future and anticipate change. Both of these organizations conducted an individual study and came to the same general conclusion, Iran currently has a robust ballistic missile arsenal and is striving to improve its capability.

The Iranian Threat: Will and Regional Perspective

Several books, professional journals, and recent news articles characterize the willingness of the Iranian leadership to conduct an offensive strike, should they deem it necessary, on U.S. and partner assets throughout the Middle East and specifically along the eastern shore of the Persian Gulf. Although there are diverse opinions on this topic, there are two common themes amongst the different reports: Iran is a rational actor with a distrust for the U.S. stemming from a long history of negative interactions; and Iran,

regardless of specific quantities or specifications, will use conventional capabilities to strike U.S. targets in the region if they deem it necessary.

William R. Polk published *Understanding Iran: Everything You Need to Know, From Persia to the Islamic Republic, From Cyrus to Ahmadinejad* in 2009. This book was very helpful in developing a foundational understanding of Iran‘s history and the importance of that history on current national perspectives. An older and more renowned book entitled *All The Shah's Men: An American Coup and the Roots of Middle Eastern Terror* was originally published by Stephen Kinzer in 2003 and updated in 2008. Both Polk and Kinzer‘s books develop a clear and factual understanding of critical events in Iran‘s history. Both also clearly point out the importance of the 1953 Iranian coup, backed by British and U.S. intelligence agencies, in the long history of distrust between Iran and the West. This coup ousted Mossadegh Mohammad, a democratically elected Iranian leader and placed into power Mohammad Rezā Shāh Pahlavi, commonly referred to as ―the Shah.” Both sources make it clear that Iran has survived decades of suppression and violence from foreign countries and that they are not easily swayed by outside pressure such as sanctions or threats.

Another noteworthy study, *The Israel-Arab Reader*, by Walter Laqueur and Barry Rubin published initially in 1969, followed by seven updates between 1970 and 2008, investigates the relationship between the Arab world and one of the U.S.‘ closest allies, Israel. Though this book does not focus on missile defense, it presents several helpful data points in describing a volatile regional relationship between Israel and the rest of the Middle East, especially Iran. The authors found the understanding of this general

relationship helpful in putting current relations between Iran and the broader Middle East into perspective.

Current sources addressing the will of Iran to conduct a missile attack on regional states as well as the perspective of those states are commonly in the form of articles, Blogs, journal essays, and reviews. *Foreign Affairs* magazine published an essay entitled ―The Dangers of a Nuclear Iran" by Eric S. Edelman, Andrew F. Krepinevich, and Evan Braden Montgomery in their January-February 2011 edition. Although the focus on the essay was on nuclear capability, it provided some valuable insight on the willingness of Iran to disregard U.S. demands despite economic sanctions, increased presence in the Persian Gulf, and political rhetoric urging compliance on specific issues. This essay also presents a discussion of coercion and deterrence specifically with respect to BMD deterrent value.

Several organizations such as the Jerusalem Center for Public Affairs, the Center for Contemporary Conflict, and the Middle East Policy Council have published assessments on this topic. On 7 July 2010 the Middle East Policy Council published a paper by Thomas Mattair entitled *U.S.-GCC Relations in the Post-War Era: An Enduring Partnership for Regional Stability?.* The Jerusalem Center for Public Affairs also published an article by Uzi Rubin entitled *The Global Range of Iran's Ballistic Missile Program*. In December 2009 the Center for Contemporary Conflict published an article by Sharam Chubin entitled *Extended Deterrence and Iran: Strategic Insights.* In these publications Mattair, Rubin, and Chubin discuss different aspects of the Iranian regional threat, but all three acknowledge that a credible missile threat does exist as does the will to use it in a regional attack.

Current publications of regional perspectives of the Iranian missile threat were more commonly found by online regional publishers such as *The Middle East Report, International Defense Digest, Defense News, UPI,* and *Arab News.* Article titles such as ―Iranian Threat Drives GCC Military Plans" and ―Missile threat comes from Iran" published by *Defense News* and *Arab News* respectively quickly communicate the general consensus by regional states that Iran is a regional threat. Each of the varying articles has a different flavor on what the Iranian threat is, but the fact that an Iranian threat exists is not in question.

Articles from the *Middle East Report* published by the Middle East Research and Information Project acknowledge that Iran is a regional threat, but also take a look at what the U.S. interests are as well. Specifically, the articles entitled ―Iran: The Populist Threat to Democracy" and ―Iran and the United States: A Clash of Hegemonies" clearly acknowledge the Iranian threat, but also calls into question the intentions of the U.S. in the region.

Minutes from regional meetings conducted by organizations such as the 7th International Institute for Strategic Studies also provided regional perspective on the Iranian missile threat. The third plenary session conducted on 4 December 2010 in Manama, Bahrain discussed the topic of ―Strategic Reassurance and Deterrence in the Region." This conference had participants from Singapore, UAE, and the United Kingdom. The minutes reflect discussions on the role of the existing Iranian arsenal in their national security architecture as well as the regional perspective on this threat. One interesting point brought out was that the international community has no issue with the

people of Iran, but rather the leadership that continues to disregard international mandates.

The Role of the Missile Defense

The traditional role of U.S. missile defense assets was easily identified in the Army's capstone doctrinal reference for Army Air Defense Artillery entitled Field Manual 3-01, *U.S. Army Air and Missile Defense Operations*, published in November 2009. From a joint perspective the role of missile defense is standardized in Joint Publication 3-01, *Countering Air and Missile Threats* published in February 2007. Both doctrinal references describe the role of missile defense as a military means to protect critical assets against aerial attack, missile attack, and surveillance. The difference between the two military references is that missile defense is described in context of the broader joint operation in Joint Publication 3-01, specifically in terms of defensive counterair operations. Both references focus on the active role in defeating an attack, but they also slightly touch on the deterrent value of missile defenses in preventing a possible enemy aerial or missile attack.

Outside of the official doctrinal references that guide military operations there is a wide array of opinions regarding the broader role of missile defense in the contemporary operating environment. References range from books discussing the philosophical change in the role of missile defense over the past 40 years to magazine articles discussing the specific role of currently deployed missile defense assets. Several online publications have also been helpful in determining the current role.

Before looking into the role of missile defense in the current global environment the author found it worthwhile to investigate the current role of missiles globally.

Ballistic Missiles in the Third World: Threat and Response, by W. Seth Carus discusses the problems associated with the proliferation of missiles in the Third World. In 2005 Richard L. Russell also published a book on the same topic entitled *Weapons Proliferation and War in the Greater Middle East: Strategic Contest.* Both Carus and Russell offer their perspective on the utility of missiles in third world countries desiring greater status amongst regional neighbors. Both also discuss the long history of missile usage specifically in the Middle East by Iraq and Iran and the fact that this usage is unequalled in any other conflict since Nazi Germany's use of ballistic missiles during World War II.[7]

Regarding books discussing the changing role of missile defense the author found several helpful sources. *From Deterrence to Defense: The Inside Story of Strategic Policy* published by Michael Charlton in 1987 presented an oral history of decisions concerning the role of nuclear weapons between President Reagan's _Star Wars' and 1986. This was helpful in building an understanding of the changing concept of missile defense utility between the 1960s and the current situation. The George C. Marshall Institute published a similar book in 1988 entitled *The Concept of Defensive Deterrence: Strategic and Technical Dimensions of Missile Defense* in which the utility of missile defense assets as a defensive deterrent was analyzed. Both Charlton and the George C. Marshall Institute provided fundamental arguments for the increasing role of missile defense in the global fight against missiles, nuclear and conventional.

[7]Richard L. Russel, *Weapons Proliferation and War in the Greater Middle East* (London: Routledge, 2005), 59.

Three additional books were used to build a comprehensive perspective of the changing role of missile defense in a global and regional conflict. *Ballistic Missile Defense in the Post-Cold War Era, Missile Defense in the 21st Century: Protection Against Limited Threats Including Lessons from the Gulf War,* and *The Missile Defense Controversy* written by David B. H. Denoon, Keith B. Payne, and Ernest J. Yanarella respectively were very helpful. Denoon, Payne, and Yanarella collectively contributed to a better understanding of the origins of missile defense, the transformation of national perspective on the utility of missile defense, and the expanding role of missile defense both for homeland defense and regional extended deterrence. Denoon also presents a thorough analysis of missile defense lessons learned on the strengths and shortcomings in the contemporary military environment as well as the changing definition of deterrence. Payne‘s assessment focuses primarily on BMD lessons from the Gulf War and addressing logical concerns by traditional critics. Yanarella‘s focus is on the political controversy surrounding this topic.

In addition to books, the author found several professional journal publications, CRS reports, Blogs, and online articles discussing the role of missile defense. These publications generally differ from the sited books in that they address the missile defense role in a very specific region given a more current setting. Like the books these sources discuss the philosophy of deterrence and coercion, but unlike the books they refer to current deployments and offer opinions on current effectiveness.

A 2007 report by Amy Woolf of the CRS entitled *Missile Defense, Arms Control, and Deterrence: A New Strategic Framework* discusses the role of both offensive and defensive capabilities from the perspective of the Bush administration‘s strategic

framework. Specifically she discusses the impact of missile defense on global relationships and international stability. The Autumn 2009 edition of the *Naval War College Review* published an article by Daniel Goure and Rebecca Grant entitled –U.S. Naval Options for Influencing Iran" in which they discussed the persuasive potential of U.S. Naval assets in the Persian Gulf, specifically in its BMD deterrent role. The 2010 *Quadrennial Defense Review* validates the importance of U.S. BMD in its role to prevent and deter conflict. All three of these documents collectively provide just a snapshot of the national importance, from governmental organizations, of missile defense assets in its traditional role of defeating missile attacks and more importantly in its role as a deterrent.

The Congressional Budget Office study *Options for Deploying Missile Defenses in Europe* of February 2009 focuses on the current and potential missile threats from Iran, as well as the options for deterring or defeating this threat, specifically from the European region. The Congressional Budget Office's assessment is comprehensive, but the true value gleaned for the purposes of this study is yet another perspective of the validity of missile defenses as not only a combat weapon system, but also as a strategic deterrent.

As with investigating the credibility of the Iranian threat there were several professional journal articles on the role of missile defense. The Middle East Policy Council and the National Defense University have each addressed various angles on this topic. The Middle East Policy Council published the journal essay *The Arms-Dynamic Pacemaker: Ballistic-Missile Defense in the Middle East* by Martin Senn in December 2009. The National Defense University hosted a conference entitled *The Changing Nature of Ballistic Missile Defense* in June 2009. Both publications from Senn and the National Defense University provide an insightful perspective similar to other works on

the changing role of BMD in the contemporary operating environment, specifically Europe and the Middle East in the midst of a credible Iranian threat.

Jeff Sessions' article entitled "Ballistic Missile Defense: A National Priority" was published in the Summer 2008 edition of *Strategic Studies Quarterly.* Joseph McMillan published an article entitled "The United States and a Gulf Security Architecture: Policy Considerations" in the March 2004 edition of *Strategic Insights* and John R. Harvey wrote "Regional Ballistic Missiles and Advanced Strike Aircraft: Comparing Military Effectiveness" in the Autumn 1992 edition of *International Security.* Sessions discusses the evolving missile threat, progress of current systems to deter or defeat the threat, future predictions of missile defense, and the political environment surrounding this topic. McMillan discusses the security architecture in the Persian Gulf, specifically the impact of the GCC's ability to find common political ground on important regional security issues. Harvey provides an older assessment of the effectiveness of regional ballistic missiles as compared to advanced strike aircraft. Though each author discusses a different aspect of regional security, each acknowledges the utility of missile defense within a regional setting.

Finally, the author was also able to find useful publications by online and traditional media sources such as *The New York Times*. An article by U.S. Army Lieutenant General (retired) Donald M. Lionetti entitled "The Case for Missile Defense in the Arabian Gulf" was posted on GlobalSecurity.org in March 2005. In this article Lionetti discusses the necessity of missile defenses based on the regional proliferation of ballistic and cruise missiles amongst less sophisticated governments and organizations. He also offers his opinion that missile defenses are politically benign and useful only in a

defensive combat role. On 2 August 2010 Representative Steve Rothman from New Jersey posted comments on The Hill's Congress Blog entitled "House Subcommittee appropriates U.S.-Israel missile defense systems at highest levels ever (Rep. Steve Rothman)." Rothman's comments reflected on the importance of funding missile defense systems based on the growing proliferation of missiles around the world. On 30 January 2010 *The New York Times* quoted General Petraeus in an article entitled "U.S. Speeding Up Missile Defenses in Persian Gulf." Petraeus was quoted for his comments on the increasing presence of U.S. Army and Navy missile defense systems in the Persian Gulf, specifically in the primary goal of deterring Iran and secondary goal of reassuring Arab states.

Methods of Assessing

Three primary areas are useful for assessing the true deterrent value of missile defense in the Persian Gulf: deterrence and coercion, current events illustrating Iranian behavioral reactions to U.S. deterrence objectives, and the concept of offensive/defensive balance. Books, government and private studies, professional journal articles, and online publications were all available on these specific topics.

An initial scan of available books produced several options dating as early as the 1960s. Two primary book sources, however, were used to develop a basic understanding of traditional deterrence theory. Paul K. Huth's *Extended Deterrence and the Prevention of War* provided a comprehensive look at the meaning and objectives of extended deterrence as well several hypotheses surrounding this complicated topic. Robert A. Pape's 1996 *Bombing to Win: Air Power and Coercion in War* provided an outstanding explanation of military coercion, the differences between coercion and deterrence, and

several historical case studies demonstrating the effectiveness of each type of coercion. Common between Huth and Pape is their ability to assess the calculus involved in the psychological struggle to change or prevent behavior leading to armed conflict.

Two CRS reports were useful in developing criteria for assessing the effectiveness of deterrence. *Disarming Libya: Weapons of Mass Destruction* was written by Sharon Squassoni in December 2003 and *Nuclear Weapons in U.S. National Security Policy: Past, Present, and Prospects* by Amy E. Woolf in January 2010. Squassoni's report briefly discussed the persuasive influence of President Bush's national security strategy, specifically citing the invasion of Iraq, on Libya's decision to disarm. Woolf's report provided an insightful look at deterrence theory, specifically the various types of deterrence before, during, and after the Cold War. Though both reports address the topic of nuclear proliferation, the discussion of deterrence theory proved to be valuable to this study on missile defense in the Persian Gulf.

Jane's open source publisher posted an intelligence review by Michael Knights entitled "Deterrence by punishment could offer last resort options for Iran" in April 2006. In this report, Knights discusses the Iranian options for deterrence by denial and punishment. He presents an insightful discussion of Iranian logic in terms of its efforts to attain regional security objectives amidst U.S. influence in the Middle East. *Jane's* also published an article by James Hardy entitled "Leaked cables show U.S. fears over North Korean missile exports to Iran" in November 2010. This article was useful in providing an Iranian behavioral data point to compare against U.S. deterrence objectives.

World Politics, International Studies Quarterly, The Middle East Quarterly, Parameters, and *Political Research Quarterly* are among several professional journals

that proved helpful in attaining varying flavors on deterrence, offensive/defensive balance, and current events pertaining to both. Robert Jervis' 1978 article "Cooperation Under the Security Dilemma" in the January edition of *World Politics* was key in developing a foundational understanding of offensive/defensive balance. Though this article was written in 1978 the logic presented remains sound in the current operating environment.

Similar to Jervis' article, Jack S. Levy published an article in the June 1984 edition of *International Studies Quarterly* entitled "The Offensive/Defensive Balance of Military Technology: A Theoretical and Historical Analysis." Levy's article is similar to Jervis' in that it provides a comprehensive look at the utility of offensive/defensive variables when attempting to affect the behavior of an adversary. The difference between the two is that Levy places far less credibility in the use of the offensive/defensive balance concept in theoretical analysis.

More contemporary works on deterrence were published by David Kreuger, Stephen L. Quackenbush, and Michael S. Gerson in 2001, 2006, and 2009 respectively. Krieger's article *Nuclear Deterrence, Missile Defenses and Global Instability* presents the argument that BMD has more to do with symbolizing offensive deterrence than it does with actual defense. Quackenbush's article "National Missile Defense and Deterrence" published in the December 2006 edition of *Political Research Quarterly* also supports the argument that missile defense generally enhances the stability of deterrence. Gerson's article "Conventional Deterrence in the Second Nuclear Age" in the Autumn edition of the U.S. Army War College's *Parameters* re-examines the conventional

perspective on deterrence and offers some additional insights as they pertain specifically to deterrence by denial in extended deterrence.

―Deterrence in the Israeli-Iranian Strategic Standoff," by W. Andrew Terrill, in the Spring 2009 edition of *Parameters* provides a more regionally focused look at deterrence in the contemporary environment. Patrick Knapp's article ―The Gulf States in the Shadow of Iran" in the Winter 2010 edition of *The Middle East Quarterly* provides a similar regional perspective as well. Both Terrill and Knapp provide different views of the Iranian regional threat, to include their aspirations to be a nuclear state, on the surrounding Middle East. More importantly they provide analysis on the causal relationship between U.S. deterrent objectives and Iranian actions, both current and future.

An independent study by the Institute for Foreign Policy Analysis entitled *Iran with Nuclear Weapons: Anticipating the Consequences for U.S. Policy* was released in September 2008. The focus of this study was on the implications of a nuclear Iran on U.S. policy, but it provided a comprehensive assessment on the deterrence dynamics of dealing with Iran. Whether dealing with deterring a conventional missile strike in the region or a nuclear Iran, the thinking is very similar. The author found this study useful in gaining yet another holistic perspective on assessing the deterrent value of a defensive capability in the Persian Gulf.

The most current collection of scholarly opinions regarding the Iranian regional threat was found in online and conventional news sources. In October 2009 the Institute for Defense Studies and Analyses published the minutes for a Fellow's Seminar entitled *GCC-Iran Relations and its Strategic Implications for the Region.* This seminar discussed

the role of the U.S. in the increased regional tension amongst Iran and the GCC. In November 2008 *MSNBC* published a story entitled ―Iran says it tested new air defense missile system," which sited Iran's continuing efforts to improve regional military capability despite U.S. sanctions and demands.

In May 2010 Yousaf Butt published and article entitled ―The myth of missile defense as a deterrent" in the *Bulletin of the Atomic Scientists.* As the title states, the focus of Butt's article is on the ineffectiveness of missile defense both technically as a weapon system and politically as a deterrent. He argues vehemently against the Obama administrations perception of the deterrent value of missile defense and the subsequent national security decisions made off of that perception.

In January 2011 *The Washington Post* published an article entitled ―After failed Iran nuclear talks: What now?" in which the results of another failed United Nations Security Council meeting with Iran were discussed. The main point of this article is that Iran is resilient and will continue to push its security objectives regardless of Western sanctions. This report provided another important data point on the effectiveness of U.S. deterrent efforts against Iran's behavior.

Summary

The issues surrounding the primary research question of this study are wide and have received the investigative attention of many scholars over time. Books, essays, professional journal articles, as well as online publications of various sorts are readily available on each aspect of this topic. Specifically, there have been numerous research efforts and publications on the individual topics pertaining to the credibility of the Iranian

missile threat, the changing role of missile defense, and methods of assessing the effectiveness of deterrence.

The purpose of this study is to use existing academic and public policy works to assess a very specific question given a specific location, threat, and timeframe. The author hopes to produce logical data points to assess current missile defense policy in the Middle East. Some of the principles and lessons developed by scholars in this literature review conflict with the existing U.S. strategy of employing missile defense in the Persian Gulf region. The gap between the ideal purpose of missile defense and the reality of results produced by actual deployments remains large. This study hopes to fill part of this gap by providing a contemporary look at the Iranian decision making calculus against U.S. deterrence objectives in the Persian Gulf, as it pertains specifically to the presence of U.S. missile defense assets.

CHAPTER 3

RESEARCH METHODOLOGY

Initial research for this study consisted of a comprehensive review of existing literature followed by intensive mind mapping. With the varying perspectives on the general topics of deterrence and missile defense the author found it useful to begin mind mapping around the deterrent value of missile defense given a specific location and threat. This process helped to refine the primary research question into a very specific subset of an otherwise overwhelming topic. Though the mind mapping efforts resulted in a focused and refined primary research question, the true value was in developing the secondary questions to build a solid argument.

The next step of the process was to review the researched material through the lens of the secondary questions. More specifically, the author reviewed the researched material to build a solid understanding of what makes the Iranian missile threat credible as well as the role of missile defense assets in the Persian Gulf. Once sufficient evidence was gathered to validate a credible Iranian missile threat and a focused U.S. missile defense force, the next step was to investigate methods of assessing the two criteria against each other. The author determined the best method to be through using established philosophies on deterrence theory and offensive/defensive balance. By understanding and applying established theories against the two criteria the author presents a qualitative analysis of the intent of U.S. policy versus the reality of Iranian action. This allows the author to produce a predictive analysis of possible future outcomes.

Each secondary question had tertiary topics that required review and understanding. In order to assess the credibility of the Iranian threat, the author first had to understand what makes a general threat credible. As will be discussed in chapter 4, the author determined that a threat requires two primary characteristics to achieve credibility: capability and will.

Establishing a completely accurate depiction of Iranian surface-to-surface capability is virtually impossible given the notorious secrecy surrounding Iran‘s military programs. However, to establish a relatively accurate depiction of the Iranian surface-to-surface capability the author relied heavily on open source reports by reliable organizations such as National Air and Space Intelligence Center, Center for Strategic International Studies, and CRS. Though it is acknowledged that truly accurate open source data on Iranian capability can never be attained, the sited sources provided enough evidence for the author to conclude that a robust capability exits. Reports published in regional and international media sources on the concern of neighboring countries over Iran‘s ballistic missile capability also strengthened the argument that a threat capability exists.

To establish the will of the Iranian leadership to use missile technology in a regional attack the author reviewed the history of Iranian warfare as well as recent public rhetoric by Iranian officials. Understanding the challenge of objectively and definitively predicting motive or will prior to an action, the author focused on likely motivations and data points that could logically lead to a conclusion of a regional missile strike.

Historical examples of Iranian missile warfare in the region strengthened the argument that the will to use available capability exists. These examples also work to

indicate the critical role of missiles in the Iranian defensive structure, especially given the current state of their conventional military equipment. Establishing the long history of distrust between the U.S. and Iran between 1953 and present day further strengthened the argument by demonstrating a logical perception of Iranian skepticism towards U.S. intentions in the region, a skepticism that could lead to a national perception of necessary conflict to preserve Iranian interests. Also strengthening the argument for will are the numerous and relatively recent provocative public addresses by Iranian officials towards the West and those regional countries that cooperate with the west.

The next critical portion of research dealt with establishing the role of U.S. missile defense assets in the Persian Gulf. As will be discussed in detail in chapter 4, the two fundamental purposes of missile defense are to deter air and missile attack and defend critical assets in the event that deterrence fails. The method for investigating the role of U.S. missile defense assets in the Persian Gulf consisted of: identifying the baseline intent for general U.S. BMD assets and identify the specific intent and application of BMD forces in the Persian Gulf.

The author found it necessary to identify, through U.S. Army and Joint doctrinal references, the baseline intent for U.S. BMD assets. Though the focus of this study is not on the specific capabilities of U.S. BMD systems, a baseline overview of capabilities and limitations was necessary to set conditions for an offensive/defensive balance assessment. As mentioned in chapter 1 the biggest limiting factor in establishing capability was the classification of actual capabilities and limitations. However, as with the efforts to describe the Iranian missile capability, the author was able to sufficiently utilize open source data to build a relatively accurate picture.

Establishing the specific intent and application of BMD forces in the Persian Gulf was done through open source reporting of unit deployments and dispositions as well as quotes by military officials such as General David Petraeus. The author‘s intent was to establish a historical perspective of U.S. BMD build up in the Persian Gulf region over the past six years and more importantly, to identify the broader purpose of this increase. With the limitation of publishing classified official mission statements encompassed in deployment orders, the author used official unclassified reports such as the 2010 *Ballistic Missile Defense Review Report* and *Nuclear Posture Review Report* to ascertain the purpose and intent behind the increase in forces. As with the challenge of objectively and definitively assessing motive or will prior to an action, the author focused on likely motivations and data points that could logically lead to a conclusion of the overarching purpose of U.S. BMD capability in the Persian Gulf.

The final critical step, prior to establishing conclusions and recommendations, was to investigate established works on the varying deterrence theories as well as offensive/defensive balance. As discussed in chapter 2, the author scanned a variety of publications on both topics. The purpose behind reviewing varying philosophies was to establish criteria common amongst the differing opinions, which could be used to assess the effectiveness of U.S. missile defense assets against the threat of Iranian regional missile attacks. In order to produce useful qualitative conclusions the author attempted to establish enough criteria on deterrence and offensive/defensive balance to sufficiently describe a logical relationship between U.S. policy intent and the reality of Iranian action.

The author recognizes that there are inherent strengths and weaknesses with this approach to research. Attempting to qualitatively analyze and predict the effectiveness of

a deterrent capability is difficult and can be quickly discredited by unanticipated actions by the adversary. However, this difficulty exists in any attempt to predict the outcome of a deterrent strategy, whether done qualitatively via description of words or quantitatively via the use of original calculus.

Also, as mentioned in previous chapters this topic is wide and diverse. The complexity of deterrence and missile defense theories, whether looked at separately or together, is such that there will always be room for further analysis, on either previous works or new angles. Based on this, the author decided to use existing data rather than designing a new research instrument. The tradeoff in time and effort paid dividends towards a quality contemporary investigation of a seasoned problem.

CHAPTER 4

ANALYSIS

> While there is probably no such thing as leakproof missile defense, the protection of a small nation with a limited number of targets is much more achievable than protecting a large span of territory such as the United States.
>
> — W.Andrew Terrill, *Parameters*

The issue of missile warfare in the Persian Gulf is physically and psychologically challenging. Geographically, there are five countries‘ worth of critical assets along the western shore of the Persian Gulf, facing widely divergent Iranian missile threats within close proximity. The physical layout of the offensive/defensive scenario is complicated within itself, especially given the ambiguity of the actual threat and the limited U.S. and GCC defensive resources. Psychologically, in the lingering moments of regional tension the question of whether or not Iran would launch a regional missile attack remains. Even more complicated, is the issue of whether or not there is anything that can truly deter such an attack should Iran determine its necessity.

This chapter presents an analysis of the three secondary questions of this study. It is necessary to analyze and answer these questions thoroughly prior to attempting to draw conclusions on the deterrent value of U.S. missile defense assets in the Persian Gulf given a credible Iranian missile threat. Information contained in this chapter collectively supports the conclusion and recommendations presented in chapter 5.

What makes the Iranian missile threat to the Persian Gulf credible?

A threat, by basic logic, must be credible to achieve the desired psychological effect on the threatened. In order to be credible, whether used as a deterrent or coercive

device, a threat must have two simple yet critical characteristics: capacity and will.[8] In terms of surface-to-surface threat credibility, Iran possesses both characteristics. Specifically, Iran presently has a robust missile arsenal and several behavioral characteristics that indicate the will to use this capability to inflict substantial effects on regional adversaries.

The value of ballistic missiles in the Iranian military strategy became apparent during the Iran-Iraq War when, in 1986, Iran began using Libyan Scud-B missiles to inflict terror on Iraqi cities.[9] Iraq also used the same methods against Iran. Missile attacks achieved marginal success with military objectives due to inaccuracy of the technology, but effects on civilian psyche were made evident when 30 percent of Tehran's population fled the city.[10] The subsequent employment of ballistic missile warfare in the years to follow, earned the Middle East the distinction of being the only region in the world, to engage in surface-to-surface missile warfare –since Nazi Germany fired Blitz bombs against England in World War II."[11]

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[8]Paul K. Huth, *Extended Deterrence and the Prevention of War* (New Haven, CT: Yale University Press, 1988), 33.

[9]W. Seth Carus, *Ballistic Missiles in the Third World: Threat and Response* (New York: Praeger Publishers, 1990), 5.

[10]Mark Kipphut, —Theate Missile Defense Reflections for the Future," *Airpower Journal* (Winter 1996), http://www.airpower.au.af.mil/AIRCHRONICLES/apj/apj96/ win96/ kipphut.html (accessed 28 April 2011).

[11]Russel, 59.

Capability

The Iranian missile arsenal has grown in quantity and complexity since the Iran-Iraq War. Although secrecy surrounding the true Iranian ballistic and cruise missile capabilities continues to hinder assessment of their potential, there is enough confirmed open source data to cause concern for U.S. and partner assets in the region. The range of known capabilities is vast and includes short-range ballistic missiles (SRBM), medium-range ballistic missiles (MRBM), and cruise missiles (CM) of various types. As depicted in figure 2, such a wide variety of capability enables an offensive potential far beyond the local Iranian boundaries.

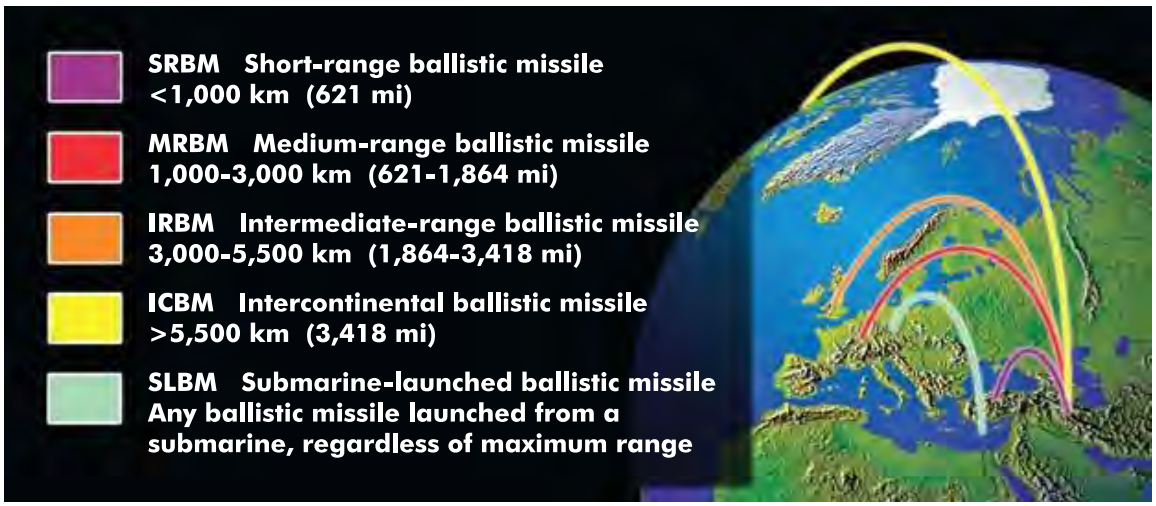

Figure 2. General Ballistic Missile Performance
Source: National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat* (Wright-Patterson AFB: Public Affairs Office, 2009), 7.

The most substantial threats in terms of quantity and type of missile launcher are the SRBM and MRBM. With the Persian Gulf being less than 50 miles wide at its most narrow parts, Iranian SRBM such as the CSS-8, Shahab 1, and Shahab 2 threaten GCC

neighbors with maximum ranges between 93 and 310 miles. The Shahab 3-variant and newly developed Ashura MRBM induce regional concerns throughout the broader Middle East and parts of Europe, with ranges in excess of 1,200 miles. Table 1 shows the Iranian SRBM and MRBM capabilities, reported by the National Air and Space Intelligence Center in 2009.

The data displayed in table 1 does not show an estimated quantity of missiles available by type. However, the National Air and Space Intelligence Center reports that the missile inventory may significantly exceed the number of launchers, given each launcher‘s ability to be re-used to fire multiple missiles. Of significant note, is the deployment mode and number of launchers of each type of missile. Approximately 150 total launchers, with the capability to fire seven types of ballistic missiles of varying ranges and an unknown quantity from mobile platforms, creates sure uncertainty for those requiring defense against these threats. Making this uncertainty more challenging are the numerous options for mobile launchers to emplace and launch; Iran spans the entire northeastern edge of the Persian Gulf and reaches depths as far as Turkmenistan and Afghanistan.

Table 1. Iranian Ballistic Missile Capabilities, as of April 2009					
Type	Missile	Propellant	Deployment Mode	Max Range (Miles)	# of Launchers
SRBM	Fateh-110 Shahab 1/SCUD B Shahab 2/SCUD C CSS-8	Solid Liquid Liquid Solid/Liquid	Road-mobile Road-mobile Road-mobile Road-mobile	120+ 185 310 93	<100
MRBM	Shahab 3 Shahab 3 Variant	Liquid Liquid	Road-mobile Road-mobile	800 1,200+	<50
	Ashura	Solid	Road-mobile	1,200+	Not Yet Deployed

Source: Created by author with data from National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat* (Wright-Patterson AFB: Public Affairs Office, 2009), 11 and 17.

The SRBM and MRBM are the most prominent missile threats, but not the only concern. There are reports of Iran having Chinese[12]-made CM. Ship-launched cruise missiles, specifically the Chinese C-802 CM, are part of Iran's power projection capability. Also part of the arsenal are PRC HY-2 Seersuckers, Anti-Ship Cruise Missiles, positioned at key locations along Iran's coast. To compliment the supply of various Chinese CM further, Iran also claims the capacity to produce Short-Range CM with significant accuracy and destructive capability. This domestically produced Cruise Missile capability presents a valid threat to oil loading and other installations across the Gulf, since they conducted these types of attacks during the Iran-Iraq War.[13]

[12]The use of "China" in this study will indicate the People's Republic of China (PRC).

[13]Kenneth Katzman, RL32048, *Iran: U.S. Concerns and Policy Responses* (Washington, DC: Congressional Research Service, 2010), 19, 33, 34.

Iran's ability to develop indigenous missile technology is limited. International sanctions on imports cripple their ability to acquire critical materials to support the development of new missile technology. However, Iran's ability to modify existing technology such as the Russian SCUD and North Korean *No Dong* have been made evident through production of their *Shahab*-series ballistic missiles. Although limited, this ability to modify existing technology enables development of cheaper and less sophisticated capabilities of dangerous utility, such as counter-BMD technology. For example, Multiple Independently Targetable Reentry Vehicles are likely out of the range of their capabilities to produce, but submunitions are not. Submunitions are less sophisticated than Multiple Independently Targetable Reentry Vehicles, but almost as effective in overwhelming BMD radars with multiple targets and allowing for wide area coverage, compensating for inaccuracy. It is crucial to understand not only Iran's physical production capacity, but also their ability to improve upon existing technology from other missile armed states, such as North Korea.[14]

Speculation on future capabilities such as Intercontinental Ballistic Missiles and Space Launched Vehicles capable of further threatening Europe and eventually, the U.S. homeland, is ongoing. These technologies are worth mentioning, as they provide further evidence of improving missile technology, but, based on their extended range, are of little importance to this specific regional study. The known variations of Iran's missile arsenal outlined thus far sufficiently validate an Iranian surface-to-surface capability. Despite the

[14]Martin Senn, "The Arms-Dynamic Pacemaker: Ballistic-Missile Defense in the Middle East," *Middle East Policy Council*, http://www.mepc.org/journal/middle-east-policy-archives/arms-dynamic-pacemaker-ballistic-missile-defense-middle-east?print (accessed 29 January 2011); David B. H. Denoon, *Ballistic Missile Defense in the Post-Cold War Era* (Boulder, CO: Westview Press, 1995), 78.

ambiguity in the actual number of missiles, specific launch locations, modifications, and disposition of systems, the existence of a valid capability remains. The establishment of the first fundamental element of threat credibility, capability, is critically important, but of greater importance is the establishment of the second key element, —will."

Will

As mentioned in chapter 3, assessing a country's will or resolve is difficult; objectivity and definitiveness present the ultimate challenge. The closest one can come to establishing an argument of will is to describe data points that lead to a logical conclusion of motivation. Establishing the will of Iran to use its surface-to-surface capability in a regional attack is no exception.

There are two factors that collectively support a logical conclusion that Iranian leaders are willing to attack U.S. and partner assets in the region with its surface-to-surface missiles: history and provocative rhetoric by Iranian leaders supported by continuous action. Strengthening the validity of these factors is empirical evidence demonstrating the perception of threat by the international community, especially regional neighbors in the GCC. Before discussing each of these factors it is critical to understand that, though there are indicators of will, such an attack would only come in the event of perceived national necessity on behalf of Iranian leaders.

Iran, despite provocative public rhetoric, is a rational actor. International concerns with a nuclear Iran are partly based on an irrational assumption of an unprovoked nuclear-armed ballistic missile attack on Europe or the U.S. homeland. Regional concerns are based on an unprovoked conventional missile attack on U.S. and partner assets throughout the GCC. An unprovoked attack in either case assumes that Iran does not

understand that ―[b]allistic missiles . . . have return addresses."[15] In the case of a nuclear-armed Iran, the international response would include a nuclear element of such destructive magnitude that an irrational and unprovoked nuclear act by Iran or one of its proxies would be nothing short of suicidal. In the case of an unprovoked conventional regional missile attack, the U.S. and GCC response alone, though not nuclear, would exact a great price on Iran.

History

Iranian history, the first key factor in establishing their will to act, encompasses reasons for Iranian disdain for the West and reasons for continued use of ballistic missiles. Their history is filled with occasions of foreign invasions beginning with Genghis Khan's Mongol invasion in 1258 and continuing to the Iraqi invasion of September 1980. The discovery of Persian oil by Russia's Peter the Great during his early 1700s conquest added reason for continued foreign invasion, in the form of military and political action. Though this oil was originally used for cooking by Peter's troops, it proved to be the major reason for foreign control of Iran by the end of nineteenth century.[16]

Regarding the disdain for the West, specifically the U.S., contempt is primarily held in the minds of Iranian leaders, as the populous largely look upon individual

[15]EastWest Institute, *Iran's Nuclear and Missile Potential: A Joint Threat Assessment by U.S. and Russian Technical Experts* (New York: EastWest Institute, May 2009), 6.

[16]William R. Polk, *Understanding Iran: Everything You Need to Know from Persia to the Islamic Republic, From Cyrus to Ahmadinejad* (New York: Palgrave Macmillan, 2009), 29, 78, 149.

American citizens with favor.[17] For Iranian leaders, the genesis of U.S. distrust dates back to the 1953 ousting of Mohammad Mossadegh in the U.S. and British backed coup. Mohammad Mossadegh was the first democratically elected leader of Iran who had logical aspirations to nationalize Iranian oil, for the good of his country. The perception of U.S. hegemony created by this event ~~–a~~bruptly and permanently ended America's political innocence with respect to Iran"[18] and was followed by a series of critical events over the next 60 years that further strengthened the distrust. These events include: the Iranian revolution of 1979; the Iranian hostage crisis, stemming from the U.S. reception of the exiled Shah, Mohammad Reza Pahlavi, and the failed rescue attempt that followed; along with the U.S. support to Iraq during the Iraq-Iran War, emphasized by the U.S. naval engagements and unfortunate destruction of an Iranian civilian aircraft in 1988.[19]

Collectively, the long history of foreign invasion, whether violent or just politically overpowering, ~~–p~~lanted in the collective memory of Iranians an abiding fear of foreign invasion"[20] and an ever growing distrust for the West, especially the U.S. This distrust seems to linger in the minds of current leaders.

Aside from proving lasting contempt for the U.S., Iran's history also contains strong evidence supporting the continued use of surface-to-surface missiles as part of the Iranian military strategy. Ballistic Missiles (BM) are common symbols of prestige

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[17]James A. Bill, ~~–I~~ran and the United States: A Clash of Hegemonies," *Middle East Report,* no. 212 (Autumn, 1999): 45.

[18]Gary Sick, *All Fall Down: America's Fateful Encounter with Iran* (New York: Random House, 1985), 7.

[19]Polk, 111, 134, 179, 184, 189, 193.

[20]Ibid., 30.

amongst third world countries. They provide an appealing alternative to growing a costly conventional force to project power throughout a region, exactly the case in Iran. Iran‘s conventional forces are generally combat ineffective in terms of symmetrical warfare largely due to their inability to support a dated force logistically, essentially making ballistic and cruise missiles a critical necessity.[21]

What separates Iran from other third world countries with aspirations of discounted regional status is actual combat experience in missile warfare. During the Iran-Iraq War they fired more than 600 BM against Iraq. Iran also observed the ineffective use of Iraqi BM against U.S. and British forces in 2003. Though Iraq‘s BM proved to be ineffective during Operation Iraqi Freedom it provided a modern venue for Iran to study U.S. BMD. In marked contrast to Iraq‘s surface-to-surface capabilities used against the U.S., Iran has a far greater program superior in quantity, technology, and flexibility. Based on the contrast between the two programs, the study of Iraq‘s poor performance against U.S. BMD is not likely to affect Iran's will to use BM and CM in a similar fashion, should they determine its necessity.[22]

Correlation of Provocative Rhetoric to Action

Historic lessons alone may not provide strong enough indicators of intent. However, when coupled with provocative rhetoric and action, the second key factor in

[21]Katzmann, 18; Senn, 4; Russell, 72; Uzi Rubin, ―The Global Range of Iran‘s Ballistic Missile Program,‖ *Jerusalem Issue Brief* 5, no. 6 (2006), http://www.jcpa.org/brief/brief005-26.htm (accessed 20 October 2010).

[22]Russell, 62; U.S. Congress, Congressional Budget Office, *Options for Deploying Missile Defenses in Europe* (Washington, DC: Government Printing Office, 2009), 2.

establishing Iranian will to act, the indicators strengthen. Words without action are essentially meaningless. In the case of Iranian rhetoric, supporting actions are not always aligned with the ferocity of the words, but actions exist nonetheless.

The U.S. perceives the greatest threat in the Middle East as the continuing efforts of Iran to seek nuclear capability. Since the most likely delivery vehicle for an eventual nuclear capability is a BM warhead, the Iranian BM program becomes just as much of a concern. The U.S. policy of dealing with Iran, essentially containment, is based on deterrence through a mixture of all elements of national power, focusing on economic, diplomatic, and military tools. A similar approach was successfully used with Libya and resulted in their decision to dismantle weapons of mass destruction and ballistic missile programs in December 2003. Some attribute the tipping point to be the U.S. invasion of Iraq in March 2003.[23]

United States‘ sanctions against Iran date back to the early 1980s and have lingered in some form or fashion to current times, almost to no avail. Unlike Libya, the Iranian leadership seems unaffected by outside pressure. Despite economic sanctions Iranian government officials have not backed down. On the contrary, they have stated their intent to retaliate in mass for any U.S. attacks. This message is simple and has only

[23]Russell, 63; Sharon Squassoni, RS21823, *Disarming Libya: Weapons of Mass Destruction* (Washington, DC: Congressional Research Service, 2006), 2; Chairman, Joint Chiefs of Staff, *The National Military Strategy of the United States of America 2011 Redefining America's Military Leadership* (Washington, DC: Government Printing Office, 2011), 8 and 11.

one qualifier: if the U.S. attacks Iran for any reason, then Iran will attack the GCC and Israel with BM.[24]

Adding weight to the Iranian proclamation are the associated actions. In the midst of U.S. demands and sanctions, Iran continues to improve its capabilities and resiliency. As discussed earlier, Iran's ability to develop indigenous missile technology is limited based on the affect of economic sanctions on acquiring materials, but this has not prevented numerous attempts to acquire controlled items abroad. These continued attempts are yet another indicator of will. The presence of U.S. BMD assets in the Persian Gulf has increased significantly in the past six years. During the same timeframe Iran has conducted numerous missile tests, hardened silos, and procured air defense systems. After failed attempts to acquire Russian S-300 air defense systems, Iran developed and tested their own version, which they called the Mersad and Shahin in November 2010. During the same month, Iran received 19 Musudan Intermediate-Range Ballistic Missiles from North Korea, giving it an additional surface-to-surface capability ranging between 2500 and 4000 km.[25]

Figure 3 illustrates the correlation between Iranian actions to increase surface-to-surface capability and international deterrent actions between 1985, when Iran first

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[24]Patrick Knapp, "The Gulf States in the Shadow of Iran," *The Middle East Quarterly* (Winter 2010): 50; Riad Kahwaji, "Iranian Threat Drives GCC Military Plans," *Defense News* (2007), http://www.defensenews.com/conference/archives/dubaiconf/3173713.html (accessed 29 January 2011).

[25]EastWest Institute, 10; Senn, 4; Ali Akbar Dareini, "Iran says it tested new air defense missile system," *msnbc.com*, http://www.msnbc.msn.com/cleanprint/CleanPrintProxy.aspx?1296702348405 (accessed 2 February 2011); James Hardy, "Leaked cables show US fears over North Korean missile exports to Iran," *Jane's Intelligence Review* (30 November 2010), http://www.janes.com.lumen.cgsc carl.com/news/defense/jdw/jdw101130_1_n.shtml (accessed 2 February 2011).

acquired BM from Libya, and 2009. The 24 year pattern clearly shows that despite sanctions by the U.S. and United Nations, Iranian efforts to further their capacity were undeterred. Even the increase in Patriot and AEGIS-BMD presence in the Persian Gulf, further discussed later in this chapter, failed to deter Iranian actions. In fact, there appears to be positive correlation between international deterrence efforts and the increase in Iranian activity. In many cases, Iranian activity increased concurrently with or immediately following imposed sanctions. The specific events represented in figure 3 can be viewed in Appendix A.

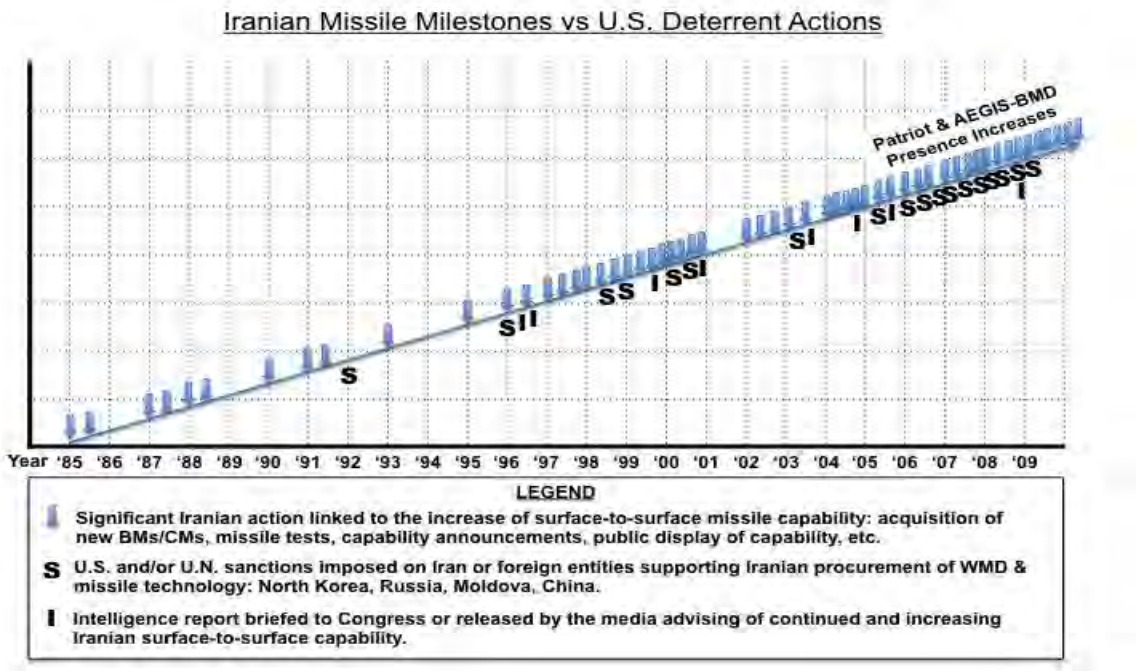

Figure 3. Iranian Milestones vs U.S. Deterrent Actions
Source: Created by author with data from Wisconsin Project on Nuclear Arms Control, *Iran Missile Milestones* (updated January 2010), http://www.iranwatch.org/wmd/wponac-missilemilestones.htm (accessed 28 April 2011).

Regional Perceptions of Threat

The combination of rhetoric and action illuminate indicators that align with historic lessons supporting the Iranian will to act. Adding credibility to these two factors is the ensuing effect on regional neighbors; empirical data demonstrating the perception of threat by the GCC supports the argument that the Iranian will is real. As with basic human communication, how a message is perceived is often far more important than the intent behind it.

The GCC has collectively increased their defensive posture against the threat of Iranian missiles over the past 10 years. The UAE' 2008 purchase of $7.9 billion worth of U.S. arms illustrates the most aggressive move towards enabling organic national defensive capability. Their purchase included state of the art Patriot weapon systems as well as the highly sought THAAD system. Other members of the GCC such as Bahrain and Qatar have not purchased their own U.S. BMD systems, but they have accepted the deployment of U.S. Patriot units within their countries, as well as the coverage of U.S. Naval BMD assets, off of their coasts.[26]

Logically, the recent build up of defensive assets is driven by the perception of a credible threat from Iran, regardless of the actual quantity and disposition of Iranian BM and CM. What is unique about this situation is that the GCC perception of a credible Iranian missile threat drives them to maintain close U.S. relations, yet the U.S. presence in the Persian Gulf is the primary source of tension with Iran.[27] As mentioned earlier in

[26]United Press International, "Arabs go for air power to counter Iran."

[27]M. Mahtab Alam Rizvi, "Fellows' Seminar: GCC-Iran Relations and its Strategic Implications for the Region," *Institute for Defense Studies and Analyses* (30

this chapter, Gulf states fear a repeat of events during the Iran-Iraq war in which CM were launched across the Gulf at GCC assets.

The sum total of Iranian surface-to-surface capability and their will to use this capability equals a credible threat. Regardless of the ambiguity in the actual quantity and disposition of the missile threat, there is enough confidence in known capability to drive defensive actions by surrounding states with significant U.S. support. More important than the verification of capability, is the establishment of the will to use it. Establishing the will of an adversary to act prior to execution is difficult and susceptible to many doubts. The Iranian will to act is made evident through collective evidence supported by historic events, coupled with provocative rhetoric, and concurrent action.

What is the role of U.S. missile defense assets in the Persian Gulf?

The advent of U.S. missile defense capabilities dates back to President Reagan's famous 1983 "Star Wars" speech, in which he introduced a strategic vision that allowed for an active defense of the U.S. against the threat of Soviet nuclear Intercontinental Ballistic Missiles. Intuitive as the concept of active self-defense seems, it was not always part of the U.S. defense strategy for BM. The initial concept of defense, as ratified by the 1972 Anti-Ballistic Missile Treaty between the U.S. and the Soviet Union, relied purely on security through mutual vulnerability. Specifically, the treaty consisted of an agreement by both sides not to develop missile defense systems. By being equally

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October 2009), http://www.idsa.in/event/GCC-IranRelationsanditsStrategic ImplicationsfortheRegion_PKPradhan_301009 (accessed 21 October 2010).

undefended, the concept of mutually destructive nuclear retaliation was intended to deter both countries from starting a war.[28]

The Role of General BMD

Reagan‘s concept was two fold: develop a weapon system to actively strengthen U.S. security and deter Soviet leaders from planning an attack based on reduced confidence in their ability to neutralize U.S. retaliatory capability. This concept has not changed to date. The general role of current U.S. BMD, though now more regionally focused, is still to deter missile attacks by reducing the adversary‘s confidence in achieving worthwhile effects and should deterrence fail to defend U.S. and partner critical assets from missile attack.

Deterrence associated with BMD is defensive deterrence or deterrence by denial. Both terms are interchangeable with respect to BMD because they both aim to convince the adversary that the defensive capabilities of BMD systems are such that any attempts to achieve offensive objectives against them would be denied. It is critical, however, to understand that though BMD contributes to deterrence by denial, there is an inherent offensive threat of punishment associated with its deployment. It is often this associated threat of offensive retaliation and not the systems‘ defensive efficiency that truly determines the effectiveness of deterrence.

United States‘ BMD systems and interceptors are very limited in quantity and not designed to provide long term defense of an asset. They are part of the joint defensive

[28]The George C. Marshall Institute, *The Concept of Defensive Deterrence: Strategic and Technical Dimensions of Missile Defense* (Washington, DC: The George C. Marshall Institute, 1988), 5-6.

counterair capability designed to enhance the survivability of critical assets from an initial strike. Optimally, the strength of an adversary‘s initial surface-to-surface capability is attrited by offensive counterair missions, specifically attack operations on launch and missile logistic sites. Unfortunately, preemptive offensive counterair missions in the Persian Gulf environment are difficult and rely heavily on intelligence indicators, warning of an imminent attack by Iran; this calculated prediction of intent is the essence of first strike decision calculus. If the country that initiates offensive action is correct in their assessment to do so, loss of critical capability may be averted. If the country that initiates offensive action is wrong, then the resulting conflict becomes a matter of necessary self defense on behalf of the attacked. Due to this balance, and because the U.S. is not currently in an armed conflict with Iran, the likely scenario, is that U.S. BMD must be prepared to defend prior to an offensive counterair augmentation of defensive counterair operations.

Before proceeding it is worthwhile to point out a difference between BMD against a nuclear and conventional missile threat. The strategy for dealing with both remains the same, attempt to deter, but be prepared to defend. The distinction lies with the national decision making process based on the associated threat of punishment. BMD between two nuclear armed players is relatively simple because both sides understand the guaranteed nuclear response, or threat of punishment, associated with a nuclear first strike. Nuclear weapons inflict such unique devastation that the only true deterrent is the threat of a symmetrical response. The *2010 Nuclear Posture Review Report* confirms the

fact that nuclear weapons continue to play a part in U.S. deterrence against regional adversaries that are nuclear armed.[29]

In terms of BMD against a conventional missile threat, the type that this study is concerned with, the national decision making is more difficult. The defensive deterrent aspect of BMD against a nuclear threat contributes by introducing ambiguity in the attacker‘s ability to destroy all nuclear capability through a first strike, thus leaving the threat of a symmetrical nuclear response on the table. Since such a response would be at least equally devastating it dominates the decision to conduct a first strike. This is not the case when dealing with BMD against a conventional missile threat. The inherent threat of offensive punishment associated with defensive deterrence against a conventional missile attack can only consist of conventional options. A nuclear response to a conventional attack is not acceptable and as Robert Pape points out in *Bombing to Win: Air Power and Coercion in War* conventional punishment rarely succeeds.[30]

The Role of U.S. BMD in the Persian Gulf

The role of U.S. BMD in the Persian Gulf, other than its dispersal of forces, is nothing out of the ordinary based on discussions thus far. U.S.‘ BMD assets are currently forward deployed in the Persian Gulf, to deter an Iranian missile attack against U.S. partner assets in the region and to defend critical assets should deterrence fail. The deterrence method is exactly as previously described for general BMD, deterrence by

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[29]Department of Defense, *2010 Nuclear Posture Review Report* (Washington, DC: Government Printing Office, 2010), 28.

[30]Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Ithaca, NY: Cornell University Press, 1996), 21.

denial or defensive deterrence with an inherent threat of offensive retaliatory punishment, should deterrence fail.

As mentioned previously, the presence of U.S. BMD assets in the Persian Gulf has increased significantly over the past ten years. In June 2003 the U.S. BMD presence consisted of prepositioned equipment. In October 2006 elements of the 32nd Army Air and Missile Defense Command deployed a command and control element to the region, along with a Patriot battalion to support the Doha Asian Games with BMD coverage. This support eventually expanded to a split based operation in which a single Patriot battalion was split between Qatar and Kuwait. Within three years the mission became enduring and the BMD footprint doubled, implementing Patriot coverage over critical assets in Bahrain and the UAE as well as positioning Aegis-BMD capability in the Persian Gulf. Figure 4 shows a graphical depiction of this growth of forces. Collectively, two Patriot battalions split across four countries with Aegis-BMD augmentation in the Persian Gulf were defending U.S. and GCC assets.[31]

[31]Brian P. Dunn, ―3-43 ADA Deploying: _We-Fight-Tonight‘ Mentality,‖ *Fires* (July-August 2007): 44-45.

Figure 4. U.S. BMD Expansion in the Persian Gulf, 2003-2009
Source: Modified by author from Unclassified *11th Air Defense Artillery Brigade End of Mission Brief*, January 2010.

The increase in BMD coverage within the Persian Gulf was part of the Bush and Obama administrations‘ effort to emphasize commitment to GCC partners and warn Iran of the consequences of continued defiance towards United Nations guidance to cease nuclear proliferation efforts. This was the U.S. attempt to add value to a credible threat by linking it to action in the form of deployed forces. General Petraeus, former commander of U.S. Central Command, described the BMD package as ―eight Patriot missile batteries [equaling two Patriot battalions], two in each of four countries" with a continuous augmentation of Aegis cruisers on patrol in the Persian Gulf. He further described the

primary goal as deterrence against Iran and the secondary goal as assurance for the Arab states.[32]

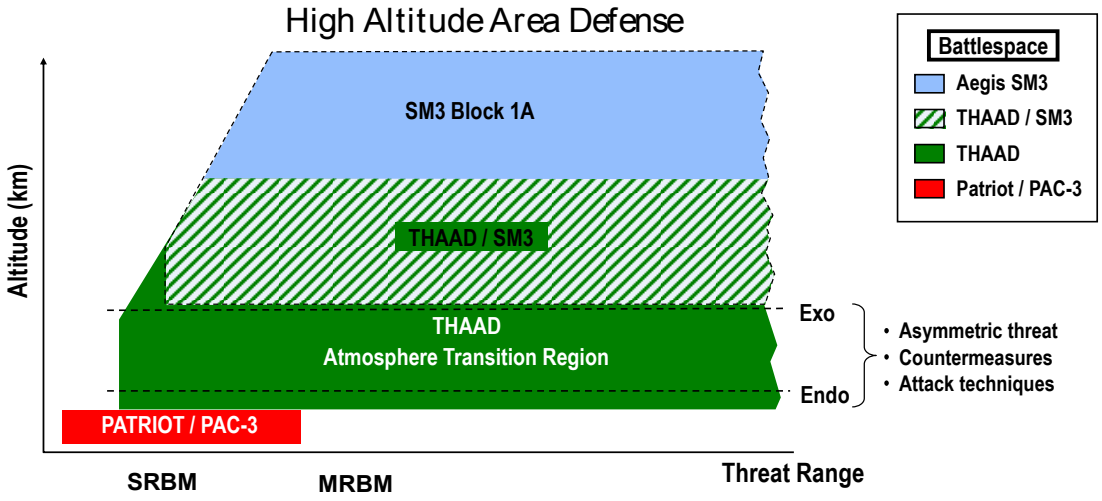

Figure 5. U.S. BMD Battle Space
Source: Missile Defense Agency, THAAD Overview Brief, Approved for Public Release 10-MDA-5716 (7 September 2010).

Of the U.S. BMD systems deployed in the region, Patriot and Aegis-BMD provide the most effective active defense against Iranian SRBM and MRBM. Collectively they provide a land and sea based platform that is able to detect, track, and destroy BM and CM at varying altitudes of flight. Figure 5 illustrates the robust battle space that both weapon systems, along with the currently un-deployed THAAD capability, covers. It is important, however, to understand that the true value of U.S. BMD assets in the region is not just the capability of one system, but more so the

[32]David E. Sanger and Eric Schmitt, ―U.S. Speeding Up Missile Defenses in Persian Gulf," *The New York Times,* 30 January 2010, http://www.nytimes.com/2010/01/31/world/middleeast/31missile.html?_r=1&pagewanted=print (accessed 2 January 2011).

collective Integrated Air Defense System consisting of active air defense components as well passive components such as fixed-wing support aircraft and command and control architectures.

As previously established, the purpose of U.S. BMD assets in the region is to execute its fundamental role of deterrence and defense, but there is also a tertiary purpose to build ―strong cooperative relationships and appropriate burden sharing" between the U.S. and GCC partners. The concept of burden sharing and increasing regional security against the Iranian missile threat demands multi-lateral agreements between the U.S. and each of the GCC members. Improved interoperability not only between U.S. BMD but more importantly, with partner nations is critical. Universal data networks and tactical procedures allow for shared early warning, decreased risk of fratricide, and increased engagement efficiency. Multiple engagements by different units, such as U.S. Patriot and Kuwaiti Patriot, based on lack of interoperability equates to missile wastage, a limited resource no country can afford to waste.[33]

The U.S. BMD forces, led by Patriot and Aegis-BMD leaders, began improving regional relationships through theater security cooperation events immediately upon deployment. As the Bush administration increased the presence of U.S. BMD assets in the Persian Gulf in 2007, they also increased intelligence sharing with GCC partners. Interoperability efforts began with the implementation of Eagle Resolve, an annual multi-lateral missile defense exercise designed to enhance and strengthen regional security. Though a seamless umbrella of missile defense coverage synchronized across GCC

[33]Dr. James N. Miller, Principal Deputy Under Secretary of Defense for Policy, Statement Before the Senate Armed Services Committee (April 2010).

partners is far from a reality, the implementation of annual exercises, conferences, and multi-lateral agreements is a positive sign that regional security through appropriate burden sharing is moving swiftly from concept to reality.[34]

In total, the purpose of U.S. BMD in the Persian Gulf reaches far beyond pure defense and includes a significant role in increasing regional security through deterrence and assurance. The deterrence strategy is defensive and founded on denial of Iranian surface-to-surface threat objectives through the use of the world's most advanced BMD capabilities. At the same time, as with any defensive deterrent, there is an inherent offensive threat of retaliatory punishment associated with the mere deployment of U.S. BMD, in any form, to the Persian Gulf. Whether or not these capabilities sufficiently contribute to the intended purpose is discussed in depth in the conclusion and recommendations of chapter 5.

What indicators illustrate the effectiveness of U.S. missile defense assets as a deterrent against the Iranian missile threat?

Thus far, the author presented sufficient evidence to establish a credible Iranian regional surface-to-surface threat and has described the role of the deployed forces intended to deter and, if needed, defend against this threat, U.S. BMD. The remainder of this study examines how the characteristics of threat and defense strategy can be compared to deduce indicators of effectiveness. Given the general role of BMD and the application of this role in the Persian Gulf, an assessment of offensive/defensive balance and further expansion on deterrence theory is necessary. An expansion on deterrence theory already discussed enables a more specific look at the psychological aims behind

[34]Knapp, 52.

deploying U.S. BMD to the Persian Gulf. An assessment of offensive/defensive balance enables a specific look at whether the perceived effectiveness of U.S. BMD in its tactical defensive role, contributes any deterrent value to these psychological aims.

Offensive/Defensive Balance

The offensive/defensive balance assessment in this study is largely based on the works of Robert Jervis and Jack Levy. Jervis' "Cooperation Under the Security Dilemma" and Levy's "The Offensive/Defensive Balance of Military Technology: A Theoretical and Historical Analysis" discuss the utility and ambiguity of assessing the predictive nature of offensive versus defensive advantages. Though the ultimate utility of such analysis is questionable both authors agree that, as Levy describes, "some of the individual variables that have been incorporated . . . may themselves be useful."[35]

The focus of this study is not on the collective offensive or defensive national power of the U.S. and Iran, but rather on the specifics of U.S. BMD and Iranian surface-to-surface capability. Even though the scope of this study is specific, the offensive and defensive situation of U.S. BMD versus Iranian BM and CM is such that valuable conclusions can be drawn even from a broad, open source comparison of assets. The true intent behind this assessment of balance is to determine whether the perceived effectiveness of U.S. BMD capabilities in the Persian Gulf creates a defensive advantage by reducing Iran's confidence in its offensive surface-to-surface capability.

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[35]Jack S. Levy, "The Offensive/Defensive Balance of Military Technology: A Theoretical and Historical Analysis," *International Studies Quarterly* 28, no. 2 (June 1984), 219; Robert Jervis, "Cooperation Under the Security Dilemma," *World Politics* 30, no. 2 (January 1978): 203.

Superior posture, whether actual or perceived, shapes the decision process of both sides when determining whether to initiate action. According to Levy, "offensive superiority increases the benefits from striking first and increases the costs of allowing the adversary to strike first." This is especially true when a conventionally inferior opponent, such as Iran, faces the offensive retaliatory punishment capability inherent in any attack on U.S. assets.[36]

By possessing offensive superiority in a specific area, such as surface-to-surface strike capability, Iran could attempt to strike quickly and violently to achieve victory or substantial advantage, before the U.S is able to mobilize and deploy sufficient retaliatory combat power, a strategy of *fait accompli.* This concept of *fait accompli* is critically important when the defensive strategy is based on rapid mobility or phased over time, such as the U.S. phased adaptive approach, described in the 2010 *Ballistic Missile Defense Review Report*. It is also critical when the defense is known to have significant resources allocated to other concurrent operations, such as Iraq and Afghanistan.[37]

The converse to a superior offense is obviously a superior defense. When the defense is superior the adversary is likely to forego an offensive attack, due to lack of confidence in achieving any objectives. A superior defense has the advantage of sufficiently protecting critical assets, without threatening the security of the adversary.

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[36]Levy, 221.

[37]Michael S. Gerson, "Conventional Deterrence in the Second Nuclear Age," *Parameters* (Autumn 2009): 33; Levy, 221.

This would be the ideal affect of U.S. BMD in the Persian Gulf on Iranian regional attack considerations.[38]

The Defense

As previously established, as of 2009 the U.S. has a total of two Patriot battalions defending assets across four countries along the Persian Gulf coast: Kuwait, Qatar, Bahrain, and UAE. Each country hosts two of the four batteries organic to a battalion, as shown in figure 4. In addition to these active defense capabilities is a continuous augmentation of Aegis-BMD in the Persian Gulf. Each Patriot battalion consists of four firing batteries doctrinally armed with six launchers. Each launcher is either Patriot Advanced Capability (PAC)-2 capable or PAC-3 capable, the difference being in number and type of missiles or interceptors that it can fire. PAC-3 launchers are capable of holding four PAC-3 pods, each of which holds four PAC-3 interceptors.[39] PAC-2 launchers are capable of holding four PAC-2 pods, each of which holds one PAC-2 interceptor. In total, a battery fully armed with PAC-3 launchers and PAC-3 interceptors could ideally control a total of 96 interceptors, whereas a fully PAC-2 armed battery could control a total of 24 interceptors. Table 2 illustrates the best and worst-case scenario in terms of total U.S. interceptors available in each of the four GCC states hosting deployed U.S. Patriot units.

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[38]Levy.

[39]According to FM 3-01.85, PAC-3 launchers are also capable of holding four PAC-2 pods; the launcher must be configured as either PAC-3 or PAC-2 and should not be mixed.

Table 2. U.S. BMD in the Persian Gulf, as of 2009

Unit	Location	Battery	# LS*	Missile Capability	Best / Worst Case**
Patriot Battalion #1	Kuwait	#1-1	6	PAC-2: -1 missile/pod -4 pods/launcher -4 missiles/launcher -or- PAC-3 -4 missiles/pod -4 pods/launcher -16 missiles/launcher	96 PAC-3 or 24 PAC-2
		#1-2	6		96 PAC-3 or 24 PAC-2
	Qatar	#1-3	6		96 PAC-3 or 24 PAC-2
		#1-4	6		96 PAC-3 or 24 PAC-2
Patriot Battalion #2	Bahrain	#2-1	6		96 PAC-3 or 24 PAC-2
		#2-2	6		96 PAC-3 or 24 PAC-2
	UAE	#2-3	6		96 PAC-3 or 24 PAC-2
		#2-4	6		96 PAC-3 or 24 PAC-2
Aegis-BMD	Persian Gulf			SM-3	

*LS: Launching Station
**Best Case indicates all 6 LS in a single Patriot battery are PAC-3 with PAC-3 missiles uploaded
Worst Case indicates all 6 LS in a single Patriot battery are PAC-2 with PAC-2 or earlier missiles uploaded
Actual LS/missile mix will vary—actual distribution and disposition is classified

Source: Created by author with data from Headquarters, Department of the Army, Field Manual (FM) 3-01.85, *Patriot Battery and Battalion Operations* (Washington, DC: Government Printing Office, July 2010), B-1.

The best case scenario in table 2, allows for 12 launchers with 192 PAC-3 interceptors to defend critical assets in each of the four countries. There are five levels of protection in the U.S. Army Patriot doctrine which dictate the number of interceptors to fire at each incoming enemy missile; the least protective level, Level 0, provides no active BMD and the most protective, Level 5, allocates four interceptor shots for each incoming enemy missile. Figure 6 shows the general levels of effectiveness used in accordance with current operational parameters to develop specific methods of fire. The most common level of effectiveness used to defend an asset is Level 2, Medium, which allocates two shots per enemy incoming missile.

FIVE LEVELS OF TBM ENGAGEMENT EFFECTIVENESS
Level 0 = NONE? 0 Shots Level 1 = LOW – 1 Shot Level 2 = MEDIUM – 2 Shots Level 3 = HIGH – 3 Shots Level 4 = VERY HIGH – 4 Shots
NOTE: The number of shots taken may vary according to the SS EKP for each weapon system. Expect engagement effectiveness = (1-(1-SSEKP)n) where is the number of interceptors.

Figure 6. Level of TBM Engagement Effectiveness
Source: Headquarters, Department of the Army, Field Manual (FM) 3-01.85, *Patriot Battery and Battalion Operations* (Washington, DC: Government Printing Office, July 2010), 3-2.

Assuming a Level 2 engagement effectiveness factor, the 192 PAC-3 interceptors available to defend critical assets in each country, now become 96 engagements. This logic is valid given an additional assumption that both Patriot batteries, at each location are manned and actively searching battle space 24 hours a day. However, this assumption of 24 hour manning and active searching is only feasible given a refined window of expected attack and is not sustainable or advisable over long periods. Factors such as maintenance and manning requirements to support the highest state of readiness, favor a cyclic schedule such as keeping one battery on active alert, while reducing the readiness level of the other, to support long term sustainment efforts. Prudently implementing a cyclic schedule further reduces the available number of no warning engagements from 96 to 48.

Following the same logic for the worst-case scenario, in which each battery is equipped and uploaded with PAC-2 capability, the lesser of the two technologies, the

available number of engagements now becomes 12. Understanding that the specifics of the actual configuration and disposition of Patriot capability in the region is classified, it is safe to assume that each of the four countries stands ready to feasibly engage the Iranian surface-to-surface threat with between 12 and 48 Patriot interceptors of mixed type. Further enhancing the readiness of the 12 to 48 Patriot interceptors are the available SM-3 missiles from Aegis-BMD cruisers depending on their location. Further assessment of SM-3 availability and disposition will not be discussed, as their position in the Persian Gulf changes and many of their specific capabilities are classified. Suffice it to say, that their presence in the region enhances early warning and engagement capability, but only marginally improves overall security given the following analysis.

Balance with the Offense

As established earlier, the Iranian surface-to-surface capability essentially equates to 150 total launchers with the capability to fire seven types of BM of varying ranges and unknown quantities, from mobile platforms. Further, though the number of missiles per launcher is unknown, the actual number likely far exceeds the number of launchers based on the ability to re-use the same launchers for multiple attacks; some sources speculate the total number of BM and CM to be in the range of several thousand. A senior Iranian official from the Iranian Revolutionary Guard was quoted in a 20 October 2007 *Iranian News Agency* report as assuring a regional response of 11,000 missiles for a U.S. strike on Iran.[40]

[40]Kahwaji.

Whether or not provocative threats of extraordinary regional missile strikes by unnamed Iranian officials are credible is unknown. What is known, however, is that given a best case status quo assumption of Patriot readiness in any one of the four GCC countries, 48 PAC-3 Level-2 no warning engagements, it would take less than one missile per known Iranian SRBM launcher to saturate U.S. defenses in one country. In terms of gross regional numbers given an unrealistic scenario of 100 percent PAC-3 capability across all four locations, with all eight batteries at full alert, 768 PAC-3 interceptors would be available to make 384 Level 2 engagements. Given this scenario, it would take four Iranian SRBM per known launcher to saturate U.S. BMD capabilities, this does not include the usage of any Iranian MRBM or CM.

Before proceeding, it is necessary to mention that BMD design, especially in a joint and coalition environment, is very complicated. Variables considered extend far beyond raw numbers of launchers and estimated interceptors. Communications architecture to support efficient data sharing, distance between defensive systems and defended assets, early warning enablers, weather, terrain, and many other critical factors, play into an extensive planning process that ultimately results in a defense plan. Also, though table 2 illustrates doctrinal missile capabilities, it does not address the ability of Patriot units to reload launchers with additional interceptors for subsequent engagements. The author does not address reload capability, based on the assumption that an Iranian missile attack would focus primarily on achieving *fait accompli* followed by a return to defense in preparation for U.S. and GCC retaliation. Subsequent attacks may occur, but will be of reduced strategic value due to the expiration of surprise and initiative.

Understanding the complexity of detailed BMD planning down to micro-level details is critical, but so is the understanding of fundamental macro-level considerations. In the study of U.S. BMD in the Persian Gulf there seems to be a fundamental issue of numerical balance of technology. As already mentioned, specifics on the Iranian threat capability are highly protected, but there is enough evidence to support an argument of credibility. Even though the numbers of actual SRBM and MRBM are unknown, the available data begs a critical question, is it reasonable to believe that Iran has less than four SRBM per known launcher capability or less than 400 total SRBM? Conversely, is it reasonable to assume that U.S. Patriot forces in the region are fully equipped and on full 24/7 alert with PAC-3 launchers and interceptors? The logical answer to both questions is no.

The most likely scenario, given the regional status quo maintained over that past six years, is that one of two Patriot batteries per each of the four GCC partner locations will be on an elevated state of readiness with a mixed capability to defend against 12 to 48 Iranian missiles, while the other conducts long term sustainment operations. Given this scenario, the Iranian surface-to-surface capability would only have to consist of less than one SRBM per launcher, to overwhelm one Patriot location or more than 192 total, to overwhelm all four Patriot locations. These figures do not include augmentation by similar BMD capabilities, such as Kuwaiti Patriot, but they also does not include Iranian MRBM or CM. Given the probability that the Iranian SRBM and likely MRBM inventories far exceed these numbers, the Iranian surface-to-surface threat definitely has offensive superiority. In keeping with the logic of offensive/defensive superiority, Iran,

by possessing the offensive advantage with specific respect to a missile fight, stands the most gain by striking first as well as the most to lose by waiting.

Deterrence Theory

Deterrence theory, as it pertains specifically to U.S. regional BMD, has already been discussed in previous sections. The author found it necessary, however, to expand a little further on the concept before proceeding to the conclusions and recommendations in chapter 5. Again, deterrence associated with conventional regional BMD is referred to as defensive deterrence or deterrence by denial, because they both aim to convince the adversary that the defensive capabilities of BMD systems are such that any attempts to achieve offensive objectives against them would be denied.

The focus of this study is not on arguing the intricacies of deterrence itself, but rather on applying the fundamental concept of deterrence to the U.S BMD strategy in the Persian Gulf. Of the three desired conditions mentioned in chapter 1—a credible threat of retaliation exists, the contemplated action cannot succeed, or the costs outweigh any possible gains—it is the second condition that is uniquely tied to the BMD deterrent strategy in the Persian Gulf. As made evident in the 2010 *Ballistic Missile Defense Review Report* and *Nuclear Posture Review Report*, forward deployment of U.S. BMD assets is intended to convince potential adversaries, that a surface-to-surface attack on U.S. and partner assets would be futile and unsuccessful.

As previously mentioned, though BMD is intended to contribute to defensive deterrence, there is an inherent offensive threat of punishment or credible threat of retaliation associated with the deployment of any U.S. asset. It is often this associated threat of offensive retaliation and not the systems‘ defensive efficiency that truly

determines the effectiveness of deterrence. The question, however, is whether or not Iran would be deterred by the threat of U.S. retaliation? As mentioned earlier, one could argue that the threat of U.S aggression would not deter Iran because deterrence or coercion by punishment historically does not work, especially given the long and resilient Iranian history of foreign invasions.

With respect to the offensive/defensive balance, the true question was whether the balance was in favor of one side and if so, whether associated advantages ensued? Based on a rudimentary outlay of known capabilities, it was determined that Iran possesses the offensive advantage for the specific category of regional missile warfare, and therefore stands to gain the most by initiating a strike if necessary. With respect to deterrence, the true question is whether or not there is anything that U.S. BMD assets can do to reduce Iran‘s confidence in a regional missile strike, given their potential advantage gained by possessing the dominant offense.

The final thought on deterrence theory, regardless of the flavor, is that it is in fact a theory. Whether entitled offensive, defensive, denial, or punishment, the fact remains that any hostile action on behalf of the adversary causes deterrence to fail, regardless of the true reason. The best one can hope for is to glean lessons learned from common patterns of failed attempts to deter, as it is far more difficult to assess why deterrence is working. On the surface, one could argue that deterrence is working so long as the adversary is not attacking, but that may be pure luck. The true reasons linked to an adversary‘s decision not to act can only be ascertained by explanation from the adversary. Should such an explanation ever be available, it is only by comparing it to deterrent objectives that one could definitively argue that deterrence truly worked.

Chapter 5, the final chapter, attempts to draw a logical conclusion of this collective study and to offer some recommendations. In both conclusion and recommendations the author will attempt to address some very basic questions, aside from the primary research question, such as: Is there anything militarily that the U.S. can do to deter an Iranian missile attack in the region? Is there anything within any of the elements of national power that can deter action? And, if the current strategy for employing U.S. BMD to the Persian Gulf does not align with the findings of this study, then why does the strategy exist?

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

> Given Iran‘s historical great-power aspirations, it is unlikely that it will reevaluate the utility of its missile program. Furthermore, the assumption that it can be dissuaded disregards the fact that defiance and self-reliance in the face of external threats are deeply engrained in Iran‘s strategic culture.
>
> — Martin Senn, *Middle East Policy Council*

After detailed examination of the secondary questions supporting this study, a number of conclusions can be made regarding the total efficacy of U.S. missile defense in its regional deterrent role against the Iranian missile threat. This chapter begins to examine these conclusions by answering the primary research question, and then proceeds to discuss subsequent findings. Recommendations for U.S. strategy on the utilization of U.S. BMD assets in the Persian Gulf region as well as recommendations for further study are also included.

Does the presence of U.S. missile defense assets in the Persian Gulf strengthen conditions for deterrence by denial against the Iranian missile threat?

Considering the answers to each of the secondary research questions, it is evident that the presence of U.S. missile defense assets in the Persian Gulf does not strengthen conditions for deterrence by denial against the Iranian missile threat. The U.S.‘ collective security architecture for this region, which encompasses far more than forward deployed BMD assets, may be achieving some deterrent effects. The answer to this question requires a separate study. However, any success in achieving cumulative deterrent effects against the Iranian threat of regional missile attack is not likely to be a result of the deployment of BMD assets to the region.

From a political perspective, Western coercion and deterrent methods in the form of sanctions and increased regional defenses hinder Iranian missile proliferation efforts and send a clear warning. However, these methods and messages do little to dissuade Iran from defiant words and deeds. Their own clear messages of massive retaliation through regional missile strikes, and their continued missile procurement and testing despite U.S. demands, are indicators that, as demonstrated on several occasions throughout their history, Iran is not likely to fold to external pressure.

From a military perspective, the offensive/defensive balance specifically between the offensive threat of Iranian surface-to-surface missiles and the defensive capabilities of U.S. regional BMD assets, is not likely to reduce the Iranian confidence in their ability to exploit the offensive advantage. If Iranian confidence is unaffected by U.S. BMD capabilities presently deployed to the region, then Iranian actions will likely be unaffected and deterrence by denial will fail. With regards to total military might, the U.S. undoubtedly has several overwhelming advantages.[41] While in terms of a finite assessment of missile warfare, the mere fact that Iran requires only four missiles per known SRBM launcher to saturate current U.S. Patriot sites, undoubtedly gives them the offensive advantage. That they likely have far more than four missiles per launcher only compounds this threat.

Accuracy and effectiveness in achieving worthwhile results is a common argument in the debate over the utility of BM warfare. However, Iran‘s ability to exploit the offensive advantage to achieve specific operational effects, such as the destruction of

[41]Among those relevant to the region are offensive counterair and strategic bombing capabilities.

U.S. military assets in the GCC, or strategic effects, such as political turbulence driven by overwhelming public terror, is not the issue; the real concern is action. Conditions support a logical Iranian perception of an asymmetric offensive advantage and the presence of U.S missile defense assets in the Persian Gulf is not likely to dissuade Iranian actions to exploit that advantage if necessary.

Conclusions

The answer to the primary research question sums up the essential finding of this study. However, there are two additional conclusions worth mentioning as they attempt to provide further insight into the issues surrounding U.S. actions regarding the Iranian missile threat.

First, U.S. missile defense assets in the Persian Gulf are not currently postured to achieve the general purpose of missile defense effectively, which are deterrence, and defense, should deterrence fail. The Iranian threat has unique and deeply rooted characteristics, such as historic "defiance and self-reliance in the face of external threats," that make it difficult to deter or coerce any action regardless of the scope, diplomatic, military, or economic.[42] As discussed in the previous chapter, assessments on the effectiveness of deterrence are ambiguous and at the mercy of any offensive action by the adversary. This ambiguity holds true in the effort to achieve deterrent effects using BMD as well.

Logically there is a relationship between the efficacy of a defensive asset and the decision by an adversary to try to challenge that defense; this is where the true friction

[42]Senn.

lies with respect to the accomplishment of the two roles of missile defense in the Persian Gulf. The issue is not the efficacy of the defensive systems, as U.S. BMD technology is arguably the best in the world; the problem is the massive imbalance between threat and defense. It is very likely that U.S. Patriot and Aegis-BMD can acquire, track, and engage any BM or CM threat that Iran launches, but engagements are limited by number of systems and interceptors available. Currently, Iran has the capacity to overwhelm superior technology with cheap volume. In order to increase the probability of achieving any deterrent effect through the use of forward deployed BMD, the offensive/defensive balance has to be resolved. The U.S. must convince Iran that it cannot overwhelm U.S. BMD before it would logically consider alternatives to a regional missile strike.

The second conclusion addresses the issue of why the U.S. would employ such a limited number of BMD assets in the Persian Gulf region given Iran‘s tremendous BM and CM strike potential. The conclusion is that the true value of forward deployed missile defense assets in the Persian Gulf is not deterrence by denial or the defense of critical assets, in the event that deterrence fails, as it should be; it is deterrence by the threat of punishment. This is the counterattack, or retaliatory attack, piece of traditional deterrence.

As discussed in the previous chapter, there is an inherent threat of offensive retaliation associated with the deployment of U.S. BMD assets. The U.S. is currently engaged in conflicts around the world, namely Iraq and Afghanistan.[43] The deliberate dedication of low density strategic assets such as Patriot and Aegis-BMD to the Persian

[43]And at the time of writing, the operations against the Libyan dictator Muammar Gaddafi.

Gulf sends a powerful warning to Iran of the U.S. commitment to this region as well. Regardless of whether or not Iran would achieve anything through a *fait accompli* first strike on U.S. critical assets currently defended by U.S. BMD, an overwhelming retaliation by the U.S. and GCC partners is guaranteed to be swift and sure.

The danger in deploying BMD assets to the Persian Gulf region in such a manner is that, as discussed in the previous chapter, deterrence by the threat of punishment, unless the punishment is nuclear, is not likely to work, especially given Iranian history. More importantly, however, splitting a Patriot battalion across multiple countries to defend against such a diverse missile threat increases unnecessary risk and produces very little gains.

Recommendations

Given the conclusions discussed above there are two recommendations for consideration. The author acknowledges the difficulty in achieving strategic balance given competing global requirements and limited resources. The first recommendation discusses a military solution and the second a diplomatic solution.

The first recommendation is truly to prioritize the U.S. critical assets in the Persian Gulf region and employ Patriot battalions accordingly. Regardless of the ambiguity of ever achieving deterrent effects through the use of missile defense, conditions to achieve tactical success must be maximized to the fullest extent possible. The consequence of failed deterrence is combat, while the consequence of failure to prepare for combat is death and destruction.

The implications of this recommendation are that either fewer GCC partners will have U.S. BMD presence or more U.S. BMD assets must be deployed. Some logical

military options for balancing defensive capabilities with the Iranian missile threat include: increasing defensive capability through the deployment of additional BMD assets or reducing the Iranian threat through offensive counterair. The reality is that offensive counterair is only likely given indicators of an imminent missile strike, which as discussed in the last chapter is very difficult to ascertain, and that the deployment of additional BMD assets is only a short term solution given limited resources and sustainability. Thus, with this reality, the U.S. must prioritize.

The current dispersal of two Patriot battalions across four countries seems to be an attempt to balance available defensive fires across a full spectrum of defended assets. Although this concept of balanced fires is doctrinally sound, it does not apply to this situation given the capabilities of the weapon system and the overwhelming distances between systems. The Patriot battalion was designed to support modular functionality in order to provide rapid short term defense of a critical asset, but it loses the ability integrate into a joint defensive architecture in doing so. In order to maximize effectiveness, especially in an enduring mission, a Patriot battalion must maintain the integrity of all of its firing batteries.

By implementing this recommendation, BMD units would provide more robust coverage to the most critical assets in the region, which would increase short term survivability long enough for U.S. and GCC partners to shift to an offensive posture, following an Iranian missile strike. BMD coverage to the region would be more concentrated in some areas and less concentrated in others; this may cause relational conflicts with GCC partners, but would reduce risk to U.S assets. The presence of U.S. BMD in the region would continue to carry the inherent threat of offensive retaliation,

but now it would also give Iran reason to believe that, though they may still attack several areas along the GCC, the probability of gaining an advantage over critical U.S. assets is likely to be reduced.

The second recommendation is for the U.S. to seek a diplomatic solution for dealing with Iranian missile aspirations that is not based on punishment. Based on the correlation of Western sanctions and Iranian compliance discussed in the previous chapter, the desired effect does not seem to be working. Recent news reports discuss the claim by U.S. officials that Iranian sanctions are working, but the 26 year pattern illustrated in figure 3 tends to demonstrate the contrary. Observations made during the vast research for this study and through reports on current events in Iran, North Africa, and the Middle East suggest that it may be advantageous and timely to seek more cooperative solutions. Also mentioned in the previous chapter is the fact that the lasting distain for the West primarily rests with the Iranian leadership, since a large portion of the country views America with favor. The danger in continuing to seek coercion through punishment is that it could lead to a tipping point and spark an armed conflict. The ensuing situation, if the perception is that Iran is acting in self defense against the U.S., could increase Iranian nationalism and destroy the current potential for positive change.

Recommendations for Further Study

Given the complexity of the broader issue of ballistic missiles and regional security in the Middle East there are several topics in need of further study. The first recommendation for further study is the topic of a nuclear armed Iran and the implications it would have on the deployment of U.S. BMD assets to the Persian Gulf or to Europe, in light of the Obama administration‘s decision to cancel the 3rd Ground

Based Interceptor site. As discussed in this study, the dynamics surrounding the offensive/defensive balance in a nuclear fight are different given the uniquely destructive nature of the technology.

The next suggested topic for further discussion is the arms race dynamic within the Persian Gulf driven by the Iranian threat. Many of the Middle Eastern states have missed some of the key military revolutions that developed the importance of discipline and doctrine, but now have the means to acquire the most advanced weapons in the world. The UAE is a prime example with their recent purchase of the most advanced Patriot and THAAD weapon systems. It would be interesting to produce a long term prediction of military capability versus effectiveness. Would the acquisition of technology force a cultural shift that supported a more Western approach towards combat proficiency or would they become another example of the Saudi Arabian Patriot force that has lost proficiency over time due to insufficient training doctrine?

The subject of missile warfare in the realm of Third World Countries, especially in the Middle East, will undergo academic, military, and security policy investigation for many years to come. This topic is critically important because, as discussed in this study, the acquisition and utilization of missile technology is a cost effective method to compete asymmetrically with the conventional dominance of the West. Ideally, a country desires the security of cutting edge technology, well trained forces, and a robust fiscal support structure. Realistically, however, most nations lack the means to attain such security and must rely on cheaper alternatives.

Misunderstanding the effectiveness and destructive potential of the inexpensive Iranian missile arsenal, based on inflated confidence in U.S. BMD technology, could lead

to the assumption of further unnecessary risk, such as improperly employing Patriot battalions. The improvised explosive device, arguably one of the cheapest technologies on the battlefield, yielded unanticipated destructive effects on U.S. forces in Iraq and Afghanistan; a critical question to consider is whether or not the Iranian missile threat, possibly numbering in the thousands, has the same potential if not properly heeded?

APPENDIX A

IRAN MISSILE MILESTONES

1985: Then-speaker of the Iranian Majlis Ali Akbar Hashemi Rafsanjani leads a high-level delegation to Libya, Syria, North Korea and China, reportedly to acquire missiles.

1985: Iran receives its first Scud-Bs from Libya.

1987: China sells Iran "Silkworm" anti-ship cruise missiles.

1987: Iran reportedly receives approximately 100 Scud B missiles from North Korea. Iran had allegedly agreed to finance North Korea‘s longer-range missile program in exchange for missile technology and the option to buy the finished missiles.

1988: China agrees to provide Iran with equipment and know-how to develop and test medium-range ballistic missiles.

1988: Iran successfully tests the 160-kilometer range Mushak-160 missile.

1990: China and Iran reportedly sign a 10-year agreement for scientific cooperation and the transfer of military technology.

1991: Iran test-fires a ballistic missile identified by U.S. intelligence as a North Korean Scud-C.

1991: Syrian chief of staff General Hikmat Shihabi reportedly visits Tehran to discuss building a factory in Syria for joint development and production of surface-to-surface missiles.

1992: The U.S. Department of State sanctions the Iranian Ministry of Defense Armed Forces Logistics (MODAFL) for engaging in "missile technology proliferation activities" with North Korea.

1993: North Korea successfully tests the *No Dong* missile to a range of about 500 kilometers.

1995: Iran receives four Scud Transporter Erector Launchers (TELs) from North Korea.

1996: The State Department sanctions North Korea‘s Changgwang Sinyong Corporation and Iran‘s Ministry of Defense Armed Forces Logistics and State Purchasing Office for "missile technology proliferation activities."

1996: Iran test-fires a Chinese-built C-802 surface-to-surface cruise missile.

1996: U.S. Rep. Benjamin Gilman (R-NY) states during a Congressional hearing on China's military sales to Iran that U.S. intelligence believes China has "delivered dozens, perhaps hundreds, of missile guidance systems and computerized tools to Iran."

1996: The Washington Times reports that, according to a Central Intelligence Agency (CIA) report entitled "Arms Transfers to State Sponsors of Terrorism," China has supplied Iran with missile technology including gyroscopes and accelerometers as well as test equipment and components for an advanced radar system.

November 1996: Iran reportedly fires, for the first time, a Chinese C-802 anti-ship missile from one of its 10 Chinese-built "Houdong" patrol boats.

June 1997: Iran reportedly tests two Chinese-built C-801K air-launched cruise missiles from a vintage F-4 Phantom, marking the country‘s first successful test of an air-launched cruise missile.

September 1997: The Russian Scientific and Production Center Inor reportedly agrees to supply Iran's Instrumentation Factories Plan with a high-strength steel alloy and three types of alloy foil used to shield missile guidance equipment.

December 1997: U.S. satellite reconnaissance reportedly picks up the heat signature of a missile engine test at the Shahid Hemat Industrial Group research facility, south of Tehran.

January 1998: According to the National Council of Resistance of Iran (NCRI), an Iranian opposition group, Iran has completed development of the Shahab-3 intermediate range missile and it is ready for production.

July 1998: Iran tests the Shahab-3 missile. According to Iranian sources, the 16-meter long missile can carry a 1,000 kilogram payload 1,300 kilometers. The missile is believed to be single-stage, liquid-fueled, scaled-up version of North Korea's Nodong missile.

July 1998: The State Department imposes sanctions on seven Russian entities for engaging in —proliferation activities related to Iran‘s missile programs.” Designated entities include Baltic State Technical University, Europalace 2000, Glavkosmos, Grafit, INOR Scientific Enter, MOSO Company, and Polyus Scientific Production Association.

September 1998: Iran publicly displays the Shahab-3 missile at a military parade. Also on display are five air-to-air missiles, Chinese C-801 and C-802 anti-ship missiles, and three Iranian-built, solid propellant surface-to-surface missiles, including the Zelzal-2, the Nazeat, and the Shahin.

January 1999: The State Department imposes sanctions on Russia‘s D. Mendeleyev University of Chemical Technology of Russia, Moscow Aviation Institute (MAI), and

The Scientific Research and Design Institute of Power Technology for engaging in ~~–p~~roliferation activities related to Iran's nuclear and/or missile programs."

February 1999: Iran's defense minister Ali Shamkhani announces that the Shahab-4 missile is in production not for military purposes, but for launching a satellite. U.S. intelligence reportedly believes the missile is derived from the 1950s-era Soviet SS-4 "Sandal" medium-range missile, which had a maximum range of 2,000 kilometers.

April 1999: Iran announces the successful test fire of the Sayyad-1, an advanced anti-aircraft missile designed and manufactured by the Aerospace Industries Organization.

August 1999: China reportedly agrees to help Iran upgrade its FL-10 anti-ship cruise missiles.

October 1999: Iran reportedly sells Scud B and Scud C missiles to the Democratic Republic of Congo (formerly Zaire). Iranian military officers and technicians are on hand to help assemble the missiles.

November 1999: U.S. intelligence reportedly believes that North Korea recently sold Iran 12 *No Dong* missile engines.

January 2000: Iran commissions three production lines at the Education and Research Institute of the Ministry of Defense. They will allegedly help Iran become self-sufficient in the production of HTPB resin, aluminum powder and potassium chlorite – all of which are useful in the production of solid rocket propellant.

February 2000: Iran reportedly tests a Shahab-3 missile equipped with a North Korean engine. The missile was launched from a TEL at a Revolutionary Guards airbase. Iranian sources say the missile has an inertial navigation guidance system and a circular error probable (CEP) of approximately three kilometers.

March 2000: Israeli and U.S. officials reportedly agree that Iran can deploy the Shahab-3 missile.

March 2000: The Iran Nonproliferation Act of 2000 (P.L. 106-178) is signed into law, authorizing sanctions against persons transferring to Iran materials and technology capable of contributing to Iran's cruise and ballistic missile programs.

April 2000: The State Department imposes sanctions on Changgwang Sinyong, a North Korean company, and Iran's Ministry of Defense and Armed Forces Logistics, Aerospace Industries Organization, Shahid Hemmat Industrial Group (SHIG) and SANAM Industrial Group for missile technology proliferation activities.

July 2000: Iran successfully tests the Shahab-3 missile, according to Iranian state media.

August 2000: In its report on worldwide proliferation, the CIA says Iran has made considerable progress in the development of ballistic missiles, and that entities in Russia, North Korea, and China continued to supply the largest amount of ballistic missile-related goods, technology, and expertise to Iran.

September 2000: Iran tests the Shahab-3 missile, but the missile reportedly explodes shortly after launch.

May 2002: Iran tests the Shahab-3 missile. According to Iranian authorities, the test is successful.

July 2002: Iran tests the Shahab-3 missile. The test is reportedly unsuccessful.

September 2002: Iran claims to have successfully flight tested the Fateh 110, a single-stage, solid-fueled missile, with at least a 200 kilometer range. Iran's state media reports the inauguration of a facility to produce the Fateh 110.

May 2003: The State Department imposes sanctions on two Moldovan companies, Cuanta S.A., Computer and Communicatti SRL, on a Moldovan national, Mikhail Pavlovich Vladov, and on Iran‘s Shahid Hemmat Industrial Group for contributing to missile programs in Iran.

July 2003: On July 20, a ceremony is held to mark the distribution of the Shahab-3 to Iran's Islamic Revolutionary Guards Corps (IRGC). The ceremony follows by several weeks what an Iranian foreign ministry spokesman calls the "final test" of the Shahab-3 missile.

November 2003: Iran's defense ministry announces that Iran does not have any program "to build the Shahab 4 missile."

November 2003: In its report to Congress on worldwide proliferation, the CIA says that Iran's ballistic missile inventory is among the largest in the Middle East and that entities in the former Soviet Union, North Korea, and China have helped Iran progress in ballistic missile production.

January 2004: Iran begins production of the Raad (Thunder) cruise missile and the DM-3b active-radar sensor for the Noor anti-ship missile.

May 2004: Iran says it has begun manufacturing a cruise missile called the Kowsar (Kosar), an indigenous stealth anti-ship missile made by the Aerospace Industries Organization. The missile is said to have three variants: shore-launched, air-launched, and ship-launched.

August 2004: Iran announces the successful test of an upgraded Shahab-3 medium-range ballistic missile, which reportedly is longer than the original version, with a larger fuel tank, and a "baby bottle-shaped" reentry vehicle and an increased range.

September 2004: Iran displays a number of missiles during the Holy Defense Week military parade, including the Zelzal, Nazeat, Shahab-2 and Shahab-3. Reportedly, two Shahab-3 variants featuring a triconic warhead, and assessed to have improved ranges of 1,500 km and 2,000 km, respectively, are displayed.

October 2004: Iran claims that it has successfully tested a more accurate version of the Shahab-3 missile.

December 2004: According to NCRI, the Aerospace Industries Organization of Iran is developing several clandestine missiles, including the Ghadr, the Shahab-4, and the Zelzal 2, and is working on nuclear and chemical warheads.

2005: North Korea allegedly supplies Iran with 18 missile assembly kits for the BM-25 (or Musudan), a modified version of Russia's SS-N-6. The SS-N-6 is single-stage, liquid-fueled, submarine missile with a range of 2,400 to 3,000 km.

May 2005: Iran's Defense Minister announces the test of a solid-fuel engine for the Shahab 3, in an effort to increase the durability and range of the missile.

June 2005: President George W. Bush issues Executive Order 13382 on Blocking Property of Weapons of Mass Destruction (WMD) Proliferators and Their Supporters. The order freezes the assets of specially designated proliferators of WMD and WMD delivery systems, as well as members of their support networks; four Iranian entities are designated under this Order including Aerospace Industries Organization, Shahid Hemmat Industrial Group, Shahid Bakeri Industrial Group, and the Atomic Energy Organization of Iran.

December 2005: According to NCRI, Iran is using underground facilities to hide missile command and control centers and to build nuclear-capable missiles.

March-April 2006: Iran holds "Holy Prophet" war games in the Persian Gulf, involving the IRGC Naval Force and Iran's regular naval and armed forces. According to Iran, missiles tested include the Shahab-2, the Kowsar, the sonar-evading Hoot (Hud, Hut) underwater missile, the surface-to-air Fajr-3, and an upgraded Nour (Noor) cruise missile. Reportedly, the Nour (Noor) may be a variant of the Chinese C-802, the Kowsar a variant of the Chinese C-801, and the Hoot based on the Russian-developed Shkval rocket-powered torpedo.

June 2006: The U.S. Department of the Treasury imposes financial sanctions pursuant to Executive Order 13382 on four Chinese companies, Beijing Alite Technologies Company Ltd. (ALCO), LIMMT Economic and Trade Company, Ltd., China Great Wall Industry

Corporation (CGWIC), and China National Precision Machinery Import/Export Corporation (CPMIEC), and on the U.S.-based CGWIC representative, G.W. Aerospace, Inc., for supplying Iran with missile-related and dual-use components.

July 2006: The Treasury Department imposes financial sanctions on Sanam Industrial Group and Ya Mahdi Industries Group, pursuant to Executive Order 13382, for their ties to missile proliferation; both are Iranian companies subordinate to Iran's Aerospace Industries Organization.

August-September 2006: During Blow of Zolfaqar war games, Iran claims to have successfully tested a radar-evading, ship-launched missile called the Sagheb, and a new surface-to-surface missile called the Saeqeh. U.S. military intelligence reportedly determines that the video of the Sagheb test released by the Iranian government is actually of an earlier Chinese missile test.

November 2006: Iran tests several missiles during IRGC-led "Great Prophet 2" military maneuvers, including the Shahab-2, Shahab-3, Fateh-110, Zelzal, and Scud-B. Iran claims the Shahab-3 was tested with cluster warheads and achieved a range of approximately 1,900 km. Anti-ship missiles, including the Noor, Kosar, and Nasr, are also reportedly tested.

December 2006: The U.N. Security Council adopts resolution 1737, imposing sanctions to prevent the transfer to Iran of materials, as well as technical or financial assistance, which might contribute to Iranian nuclear and ballistic missile development. The resolution designates eight Iranian entities involved in missile activities, for which financial resources are to be frozen.

January 2007: The Treasury Department imposes financial sanctions on Bank Sepah, a state-owned Iranian financial institution, pursuant to Executive Order 13382. Bank Sepah is described by Treasury as "the financial linchpin of Iran's missile procurement network."

February 2007: Iran tests the Tor-M1 short-range air defense system provided by Russia. The Tor-M1 system has a reported range of 12km, which may be increased to 20km. Iran's IRCG Air Force Commander claims that the system is capable of tracking 48 targets and engaging 8 targets using electro-optic and infrared comprehensive systems.

February 2007: Iran claims to have tested a suborbital research rocket as part of the country's space program, which may include an effort to develop an independent satellite launch capability. U.S. missile launch sensors reportedly detect no such test.

March 2007: The U.N. Security Council adopts resolution 1747, imposing further sanctions to prevent the transfer of arms and financial assistance to Iran, and designating additional Iranian entities involved in ballistic missile activities, for which financial resources must be frozen.

June 2007: The Treasury Department imposes financial sanctions on two Iranian companies involved in missile work for Iran's Aerospace Industries Organization (AIO), which directs Iran's missile program. Fajr Industries Group is an AIO subordinate involved in the production of missile guidance systems and Mizan Machine Manufacturing Group is an AIO front company involved in procurement.

September 2007: Iran displays the "Ghadr" missile (also called Qadr-1) during a military parade, claiming it to be an upgraded version of the medium-range Shahab-3 with a range of 1,800 km. Experts say the Ghadr appears identical to a Shahab-3 variant displayed in 2004. The Ghadr, along with other missiles displayed during the military parade, including the Shahab-3, the Fateh-110 and Zelzal-3, are in possession of the IRGC Air Force.

November 2007: Iran says it has built a new missile, the "Ashura" (or Ashoura), with a range of 2,000 km. Descriptions of the Ashura vary from a multi-stage, solid-propellant missile to a missile that uses non-SCUD technology. It is reportedly depicted in a U.S. Missile Defense Agency (MDA) report as a stretched version of the liquid-propelled Shahab-3, fitted with larger tail fins, and in an April 2008 Israeli report as a two-stage solid-propellant missile with a triconic nose shape.

February 2008: Iran claims to have successfully launched its Kavoshgar 1 rocket into space. The launch was one of several aerospace projects unveiled. Iran also inaugurates a space center with a satellite control and tracking station and displays its "Omid" satellite. Iran claims that the Kavoshgar is a two-stage rocket, that it reached an altitude of 200 km, and that it successfully made contact with the ground station. Private analysts believe that the Kavoshgar is a single-stage, liquid-fueled missile and that the space center, located 230 km southeast of Tehran, has the potential to be used in developing long-range missiles.

March 2008: The U.N. Security Council adopts resolution 1803, extending travel restrictions and asset freezes to – and in some cases instituting a travel ban on – additional Iranian entities, and barring Iran from buying almost all nuclear and missile-related technology.

July 2008: Iran claims to have successfully test-fired a Shahab-3 missile with a range of 2,000 km, as well as Zelzal and Fateh surface-to-surface missiles, during "Great Prophet III" war games run by the IRGC in the Persian Gulf.

August 2008: The Treasury Department imposes financial sanctions on two Iranian firms, the Safety Equipment Procurement Company (SEP Co.) and Joza Industrial Company, pursuant to Executive Order 13382, for their links to procurement for Iran's missile program.

August 2008: Iran launches the "Safir," a two-stage, liquid fueled rocket based on the Shahab-3 missile, according to analysts. The rocket is about 22 meters long, with a

diameter of 1.25 meters, and weighing over 26 tons. According to Iran, the rocket is intended as a satellite launch vehicle. Contrary to initial reports, however, the launch does not place a satellite into orbit.

September 2008: The Treasury Department imposes financial sanctions on the Islamic Republic of Iran Shipping Lines (IRISL) and eighteen of its subsidiaries, pursuant to Executive Order 13382, for facilitating shipments of military cargo for MODAFL and its subordinate entities. MODAFL has brokered transactions involving ballistic missile-related materials and technologies.

September 2008: The Treasury Department sanctions six Iranian military firms, pursuant to Executive Order 13382. Three of these firms, Iran Electronics Industries, Shiraz Electronics Industries and Iran Communications Industries, make communications equipment for Iran's military. Iran Aircraft Manufacturing Industrial Company (HESA) develops and produces unmanned aerial vehicles and other military aircraft and its subsidiary Farasakht Industries makes aerospace tools and equipment. These entities are owned or controlled by MODAFL.

November 2008: Iran claims to have successfully tested the Sejjil (Sejil), a two-stage, solid fuel, surface-to-surface missile with a range of nearly 2,000 km. According to private analysts, the missile appears to be larger than Iran's Shahab-3, with a total length of about 22 meters, and share some design features with Soviet-era ballistic missiles.

December 2008: Western intelligence sources reportedly state that in 2008 Iran more than tripled the number of operational Shahab-3 missiles, with over 100 missiles now delivered to the IRGC.

February 2009: Iran successfully launches the "Omid" telecommunications and research satellite into orbit, from Semnan province, using its own rocket, the Safir 2. The rocket is 22 meters long, weighs 26 tons and has a diameter of 1.25 meters, according to the head of Iran's Space Agency. It is a two-stage rocket that lofted the 27 kg Omid into low earth orbit at an altitude of 250 km.

April - May 2009: Iranian officials are reportedly present when North Korea launches a long-range rocket (Unha-2) in April and detonates a nuclear device in May.

May 2009: Iran successfully test fires the Sejjil-2 missile from Semnan province. Iranian authorities claim that this version of the missile has improved sensors and that production of the missile has begun.

June 2009: Iran launches mass production of a ground-to-air missile defense system, called Shahin, reportedly capable of tracing and targeting aircraft within a range of about 40 km.

September 2009: IRGC holds Grand Prophet war games. Shahab 3, Sejjil, Shahab 1 and 2, Fateh, Tondar, Zelzal, and various short-range missiles are test fired. An Iranian news organization reports that the Sejil's operational range is 2,000 to 2,500 km.

December 2009: Iran successfully test-fires an upgraded version of the Sejil-2 (Sijjil-2) missile. Defense Minister Ahmad Vahidi says that the new version has a shorter launch time and great maneuverability.[44]

[44]Wisconsin Project on Nuclear Arms Control, *Iran Missile Milestones*, updated January 2010, http://www.iranwatch.org/wmd/wponac-missilemilestones.htm (accessed 28 April 2011).

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