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# THESIS

**COMMAND STRUCTURE OF THE BALLISTIC MISSILE DEFENSE SYSTEM**

by

David B. Weller

March 2004

Thesis Co-Advisors: Dan C. Boger
J. Bret Michael

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The United States is embarking on a course of designing and fielding a Ballistic Missile Defense System (BMDS) to protect the US and her citizenry against ballistic missile attacks. The BMDS will need a Command and Control, Battle Management, and Communications (C2BMC) organization/system to support military and national decision makers in times of crisis. The C2BMC must also be able to react quickly once a missile event has occurred. This thesis will cover the doctrinal issues with merging Theater Missile Defense (TMD) and the National Missile Warning System into one system, how the Unified Command Plan affects missile defense efforts, the lessons learned from Desert Storm, and presents alternative chains of command that might allow the BMDS to engage threat missiles in a timely and efficient manner. Preliminary findings indicate that a 'flattened' chain of command for missile defense forces seems to be a positive starting point for the initial deployment of the BMDS.

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# COMMAND AND CONTROL OF THE BALLISTIC MISSILE DEFENSE SYSTEM

David B. Weller
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1992

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**March 2004**

Author: David B. Weller

Approved by: J. Bret Michael
Thesis Advisor

Dan C. Boger
Co-Advisor

Dan C. Boger
Chairman, Department of Information Science

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# ABSTRACT

The United States is embarking on a course of designing and fielding a Ballistic Missile Defense System (BMDS) to protect the US and her citizenry against ballistic missile attacks. The BMDS will need a Command and Control, Battle Management, and Communications (C2BMC) organization/system to support military and national decision makers in times of crisis. The C2BMC must also be able to react quickly once a missile event has occurred. This thesis will cover the doctrinal issues with merging Theater Missile Defense (TMD) and the National Missile Warning System into one system, how the Unified Command Plan affects missile defense efforts, the lessons learned from Desert Storm, and presents alternative chains of command that might allow the BMDS to engage threat missiles in a timely and efficient manner. Preliminary findings indicate that a 'flattened' chain of command for missile defense forces seems to be a positive starting point for the initial deployment of the BMDS.

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## List of Acronyms

| | |
|---|---|
| ABL | Airborne Laser |
| ABM | Anti-Ballistic Missile |
| AFCEA | Armed Forces Communications and Electronics Association |
| BM | Ballistic Missile |
| BMDO | Ballistic Missile Defense Organization |
| BMDS | Ballistic Missile Defense System |
| C2 | Command and Control |
| C2BMC | Command and Control, Battle Management, and Communications |
| C3 | Command, Control, and Communications |
| C4I | Command, Control, Communications, Computers and Intelligence |
| CAP | Crisis Action Planning |
| CC | Combatant Commander |
| CJCS | Chairman Joint Chiefs of Staff |
| CMOC | Cheyenne Mountain Operations Center |
| COC | Chain of Command |
| COP | Common Operational Picture |
| CSG | Carrier Strike Group |
| DHS | Department of Homeland Security |
| DoD | Department of Defense |
| DSP | Defense Support Project |
| GAO | Government Accounting Office |
| GMD | Ground-Based Midcourse Defense |
| GWOT | Global War on Terrorism |
| J2 | Joint Staff Intelligence Staff |
| J3 | Joint Staff Operations Staff |
| JFACC | Joint Forces Air Component Commander |
| JTAGS | Joint Tactical Ground Station |
| JTF | Joint Task Force |

| | |
|---|---|
| JTIDS | Joint Tactical Information Distribution System |
| KGB | Committee of State Security (*Komitet Gosudarstvennoye Bezopastnosti*) |
| ICBM | Intercontinental Ballistic Missile |
| LRBM | Long Range Ballistic Missile (also ICBM) |
| MIRV | Multiple Independently targeted Re-entry Vehicles |
| MRBM | Medium Range Ballistic Missile |
| NMCC | National Military Command Center |
| NORAD | North American Aerospace Defense Command |
| NSS | National Security Strategy |
| OPCON | Operational Control |
| OPLAN | Operational Plan |
| POTUS | President of the United States |
| RCC | Regional Combatant Commander |
| SBIRS | Space Based Infrared System |
| SECDEF | Secretary of Defense |
| SDI | Strategic Defense Initiative |
| SALT | Strategic Arms Limitation Talks |
| SLBM | Submarine Launched Ballistic Missile |
| SLV | Satellite Launch Vehicles |
| SPACECOM | Space Command |
| SRBM | Short Range Ballistic Missile |
| START | Strategic Arms Reduction Talks |
| TMD | Theater Missile Defense |
| UCP | Unified Command Plan |
| ULOA | Unauthorized/Limited Objective Attack |
| USCENTCOM | United States Central Command |

| | |
|---|---|
| USJFCCOM | Unites States Joint Forces Command |
| USNORTHCOM | United States Northern Command |
| USPACOM | United States Pacific Command |
| USSOUTHCOM | United States Southern Command |
| USSOCOM | United States Special Operations Command |
| USSTRATCOM | United States Strategic Command |
| WMD | Weapons of Mass Destruction |
| WME | Weapons of Mass Effects |

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# I. INTRODUCTION

## A. PURPOSE OF THESIS

The Ballistic Missile Defense System (BMDS) will provide a layered global defense against ballistic missiles of all classes (short-, medium-, and long-range). The command and control/battle management of the BMDS is a core element of the system-of-systems; this element is called the Command and Control, Battle Management, and Communications (C2BMC) system. Much of the C2BMC capability will need to be automated, due to the speed of engagements, quantity of battle-related information, and complexity of the decision processing, all or which portend strict time budgets for executing battle plans. In this thesis, we treat the topic of command structures; with the aim of identifying what type of command structure will be needed in order to effectively interact with the automated portion of the system, which will include the battle managers. The initial findings indicate that the command structure for missile defense will need to be flattened.

## B. BMDS OPERATION

The BMDS and its command and control module, the C2BMC, will operate in an unpredictable environment. Like most strategic command and control systems the majority of the time the system will be tracking almost nothing, passing messages only to ensure that point-to-point connectivity is maintained. However, the system must also be robust enough to neutralize any threat to the United States that ballistic missiles worldwide could present. The system will be required to help maintain the proficiency of the staff that mans the watch. To this end the system must be able to be both on-line for the sections that are on duty and off-line for the sections that are training and developing scenarios. These stated run-time requirements for the BMDS and C2BMC dictate that the battle management, node connectivity, and command structure be readily adaptable in order to address new types of threats.

The BMDS is a new and different type of warfare that does not easily fit into the traditional military molds. The use of some of these molds is, however, necessary to allow for the military organization to absorb and interact with the BMDS. BMDS will be a global organization with each node depending on other nodes for the system to work correctly. There are few instances of such a global battlespace control. The Nuclear Triad is one possible example of global centralized C2, but that organization has never had the numbers of elements that the BMDS will have. The use of Special Operations Forces (SOF) teams in the Global War on Terror (GWOT) is another possible example, but the SOF teams do not, generally, have interdependencies that extend more than the range of the longest artillery round or the longest stand off weapon. Therefore, the operation of the BMDS is deemed to be different than that of other forms of modern warfare, to that end the application of a conceptual model is also different.

## C. THESIS ORGANIZATION

The issues pertaining to the command and control structure of the BMDS are still largely unresolved. In this thesis the analysis of command and control is based on the following: Joint Doctrine, Chairman of the Joint Chief of Staff Instructions and Directives, personal interviews with Missile Defense Agency (MDA) engineers, and lessons learned from Desert Shield and Desert Storm to base the recommendations on.[1] Chapter II describes the current battle space that BMDS is likely to be deployed into, applicable treaties that have steered development of previous missile defense systems, and instances of political instability that could have started a limited nuclear war. Chapter III is a review of the Unified Command Plan, the National Security Strategy and current Theater Ballistic Missile (TBM) doctrine to provide a basis for C2BMC doctrinal development. How the C2BMC should operate using MDA's Short/Medium/Long (S/M/L) Range engagement plan is discussed in Chapter IV. Chapter V covers individual combatant command responsibilities with respect to missile defense, how planning for possible engagements will tie into current Joint Operation Planning guidance and lessons learned from Desert Shield and Desert Storm. Chapter VI provides several options for chains of command for missile defense forces. The thesis concludes with a discussion of the challenges and possibilities for the C2BMC in the upcoming deployment of BMDS.

## D. THESIS METHODOLOGY

The scope of the thesis is limited to a conceptual exploration of the command structure for the Ballistic Missile Defense System. The C2BMC will have to support the command structure and be adaptable to changes that will be

[1] Desert Shield/Desert Storm has been the only recent large force engagement where ballistic missiles were used in any numbers. Operation Enduring Freedom and Operation Iraqi Freedom never had a ballistic missile fired at the defenders so the lessons learned must be judged to be at least a little suspect.

made to the base assumptions. The conceptual model for BMDS command and control (C2) is based on variations of the current conventional forces chain of command that the US military has used over the last fifty years.[2]

Assumptions for the model are based on the current Unified Command Plan (UCP), military doctrine, and current C2 systems. Constraints on the conceptual model are based on the mission of BMDS as described by both military and political leaders, applicable treaties entered into by the United States, the short-, medium-, and long-range missile layered defensive scheme, limited time budgets for successful intercepts, and the fact that the BMDS system will evolve over time. All of the assumptions and constraints can, and some will, change over the course of the next several years.

The nature of the threat that the BMDS will face will change over the evolution of the BMDS. Just as the V2 first introduced ballistic missile warfare in World War II, there is the possibility that another advancement in missile technology will radically change the way the BMDS, and thereby the C2BMC, must defend against this new threat. As these variables change, the recommendations for BMDS command structures may also change.

[2] Joint Publication 0-2, *Unified Action Armed Forces (UNAAF)*, has a comprehensive description of the current conventional chain of command. There are exceptions to this type of chain of command and they will be referenced as examples for possible missile defense forces chain of command.

# II. BACKGROUND

## A. MISSILE DEFENSE

President George W. Bush announced his decision for the United States to field the Ballistic Missile Defense System (BMDS) on 13 December 2001.[3] The proliferation of missile technology has made it possible for almost any nation, or well financed terrorist organization, to buy missiles that can reach American citizens or American interests throughout the world.[4] A credible missile defense is an imperative against nuclear blackmail in the future.

The outline of the proposed capabilities for the initial BMDS showed that the system's near-term objective was the ability to defeat a rogue state launch (five to ten missiles) or an unauthorized or limited objective attack (ULOA) by any adversary (twenty to fifty missiles).[5] Given the number of ballistic missiles that Russia and China possess, the intent of the initial BMDS was not to be able to defeat all the missiles of an all-out attack by either of those two nations. Future expansion of the BMDS will be a global missile defensive shield for the United States, her allies, and the world. By 2007 the system will be able to target multiple missile launches throughout the world at any time.

The command and control (C2) aspects, organization and operational control, of the system should not change much from the first iteration to the later iterations, for ease of operations, employment and cost effectiveness.

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[3] www.whitehouse.gov. Downloaded 22 September 2003.

[4] Warrick (2003)

[5] Wirtz et al (2001) p.335

Therefore, it is imperative that the C2BMC be robust enough to allow for the added systems and capacity that the system will evolve into over the years.

## B. INTRODUCTION TO MISSILE DEFENSE

### 1. Hit-to-Kill Philosophy

The hit-to-kill philosophy uses an interceptor, with a payload of one or more kill vehicles, launched against an inbound enemy ballistic missile. The interceptor releases a kill vehicle to complete the engagement; the kill vehicle uses the kinetic energy generated by very high closing speeds between the kill vehicle and the inbound ballistic missile to destroy the inbound ballistic missile. The closure speed ($V_c$) encountered as the two missiles race towards each other exceeds Mach 14, or over 7500 miles per hour.[6] Intercepts at these speeds is a challenging problem. Early work in missile defense interceptor development focused on using small nuclear charges in the interceptors to destroy multiple inbound missiles. Nuclear interceptors are currently used by Russia in their ABM system that is deployed around Moscow. However, the use of nuclear interceptors is undesirable for from the perspective of the of consequence management: since nuclear debris and electromagnetic pulses could have a devastating impact on the nations proximate to the missile intercept. The United States shifted its work on the interceptors to shaped charge interceptors in the late 1960s[7].

In theory, with shaped charge warheads the kill vehicle can determine the miss distance and direction very late in the engagement and detonate the warhead in the

[6] MDALink website. Downloaded 12/16/03

[7] Graham (2001) p.10

direction of the attacking missile; the attacking missile would then pass through the debris cloud and itself be destroyed. Shaped charges however can weigh almost as much as a nuclear warhead so there is no increase in speed or range using a shaped charge interceptor.[8]

Hit-to-kill type interceptors have become the means of choice to destroy inbound ballistic missiles, by using the kinetic energy of the interceptor, as the 'warhead,' the interceptor must strike the attacking missile. The perfect geometry for the interceptor is a head-to-head hit. A head-to-head hit will destroy both missiles, but debris from the impact will fall to the earth at some point. Making the interceptor impact the inbound missile increases the complexity of the intercept, but as the first test of the Ground-Based Midcourse Defense interceptor (GMD) conducted in 1999 showed, hit-to-kill intercepts are technically feasible.[9]

**2. Non-Nuclear Interceptors**

Congressional legislation, within the Defense Authorization Act for Fiscal Year 1998, mandated the elimination of nuclear warheads on US interceptors for missile defense in 1999.[10] Given the mandate to use something other than nuclear-armed interceptors, the Ballistic Missile Defense Organization (BMDO), the predecessor to MDA, chose kinetic (hit-to-kill) kill vehicles over the shaped charge kill vehicles. Given the complexity of the shaped charge system the best way to ensure destruction of the ballistic missile is to keep the

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8 Ibid

9 Graham (2001) p.188

10 Thomas On-line Library. Senate Bill 1059 from the 106th Congress. Downloaded 3 December 2003

kill vehicle as simple, and as light, as possible therefore BMDO determined that a hit-to-kill vehicle was the best choice.[11]

## C. APPLICABLE TREATIES

To understand the system-of-systems that BMDS will become, it is helpful to understand the treaties that the United States was bound to during the last three decades. These treaties were signed by the Soviet Union and the United States. After the dissolution of the Soviet Union, the countries of Belarus, Kazakhstan, Ukraine, and Russia inherited nuclear weapons as a result of the breakup of the Soviet Union. The U.S. continued to abide by the applicable treaties as a 'good faith' gesture while working with the newly founded, or reformed, counties. Belarus, Kazakhstan, and Ukraine have become members of the United Nation's Nuclear Non-Proliferation Treaty as non-nuclear members and have destroyed, or transferred to Russia, all their nuclear materials. Russia has maintained a number of strategic delivery systems, and is working to develop new systems, to retain their place as a strategic superpower.

### 1. SALT I

The Strategic Arms Limitation Talks (SALT) were the first serious attempt at limiting the increasing number of ICBMs and SLBMs that both the Union of Soviet Socialist Republics (USSR) and the United States were deploying. In many ways the SALT was an interim measure, a holding pattern, while the two parties worked on the Anti-Ballistic Missile Treaty.

The Soviet Union and the United States had widely different approaches to strategic deterrence. The United

[11] Graham (2001). p.92

States' more technologically advanced weapons were smaller in yield but far more accurate and reliable than the Soviet missiles. The Soviets made up for the technological inferiority by having huge throw-weight weapons that would make up for accuracy through destructive power. The asymmetry in the forces made equivalent limitations very problematic. While SALT I failed to cover mobile ICBMs, the treaty was a milestone for strategic relations between the US and the USSR.

**2. SALT II**

The US Senate, in response to the Soviet invasion of Afghanistan in 1980, did not ratify the Strategic Arms Limitation Talks II Treaty. However, both countries did abide by the treaty limitations for more than a decade. The goal of SALT II was to form a long-lasting comprehensive treaty that would put limits on a broad number of strategic offensive systems, by providing for an equal number of strategic nuclear delivery vehicles. The aggregate number of delivery devices was limited to 2,400. There was an additional limit to the number of Multiple Independently targeted Re-entry Vehicles (MIRVs) that could be deployed; that limit was 1,320. Thus, SALT II was, like Apollo 13, a successful failure.

**3. START I**

The Strategic Arms Reduction Treaty I was complicated by the dissolution of the Soviet Union four months before the treaty was to enter into force. Three and one half years after the original date, the treaty did enter into force between Russia, Belarus, Kazakhstan, Ukraine and the United States.

The strategic arsenals of the US and the Former Soviet Union (FSU) states were reduced by over 30% under the START I Treaty. START I also established prohibitions on training, testing, and modernization of certain types of weapons.

**4. START II**

The latest treaty between the United States and Russia concerning strategic arms was entered into force on December 5, 2001. Its goal, like that of its predecessor (START I), was to further reduce the number of strategic arms that each side had to levels of between 30-45% of the original pre-START numbers. The treaty did reduce the number of warheads, bombers, and MIRVs, but even further reductions have been unilaterally announced by both the United States and Russia since the treaty entered into force.

**5. Anti-Ballistic Missile Treaty of 1972**

The Treaty on Limitation of Anti-Ballistic Missile Systems entered into force on October 3, 1972. The provisions of the treaty were such that each of the signatories, the United States and the Union of Soviet Socialist Republics, could only build two deployment sites, the placement of which were so restrictive that the combined systems could not defend the entire country. Later the treaty was amended to only one deployment area, around each signatory's capitol. The United States chose not to deploy a system around Washington DC and later deactivated its only defensive system in North Dakota in 1976.

On June 13, 2002 the United States unilaterally withdrew from the Anti-Ballistic Missile (ABM) Treaty of 1972. The move was much more substantive than most people first believed. With the conditions that the ABM treaty imposed on the United States, a BMDS-type system could not be built. Testing overlap between different range sensors or development of a strategic Command and was prohibited by the ABM treaty.[12] After withdrawing from the ABM treaty the US was able to develop a strategic command and control system for the BMDS, it was at this point that the Battle Management Command and Control (BMC2) became the Command and Control Battle Management and Communications (C2BMC) system.

The entire point of the ABM treaty was that neither country would have been able to survive the counter attack from a first strike by the other. The administration has determined that the United States cannot accept to take the 'first shot' since it may not have a known adversary to retaliate in kind against. Third party players (e.g. criminal organizations, terrorist groups, rebel insurgents who capture weapons) all have the capacity to acquire and launch ballistic missiles: if they do launch against the US, who then could the US retaliate against?

**D. SOVIET ABM SITE**

The Soviet Union deployed the A-35 ABM system, NATO codenamed ABM-1, around Moscow in 1978. The system was modernized and upgraded several times through the early 1990s; the current system is the A-135 (the NATO codename

[12] The ABM Treat of 1972 limited the type sensors that could track Ballistic Missiles during ballistic missile testing. With the limitation removed one launch can be used to test several different systems with the BMDS system giving the US more research and demonstration opportunities.

is the ABM-3). The original system was conceived in the late 1950s, but technical challenges delayed the deployment almost thirty years. The system was modified in development to keep within the limits of the 1972 ABM treaty but with only 100 interceptors there was little hope that the system would fully protect the Soviet capital against an all out reprisal from the United States and NATO.[13]

While the Russian interceptors have never been fired at real inbound ballistic missiles, the system is a successful deterrent. The Russian system does protect Russia, and more particularly Moscow, from nuclear blackmail and coercion. The Russian government kept the system and improved it over the years to provide a reasonable defense against smaller nuclear powers, including China.[14]

**E. CURRENT AND FUTURE THREATS**

The proliferation of ballistic missiles has accelerated during the last two decades, in part due to the following three reasons. The first reason is the disintegration of the Soviet Union, which placed a large number of short to medium range missiles on the commercial and black markets and left many scientists, designers, and missile production workers unemployed and looking for work. The second reason is the increase in technology. The rapid increase in technology has allowed almost any country with the economic ability to have a 20 to 30 million Dollar missile program the opportunity to develop and deploy

[13]. www.janes.com. Jane's Intelligence Review, February, 1999. Downloaded 12/19/03

[14] Ibid.

short- to medium-range ballistic missiles.[15] The CIA's *National Estimate of Foreign Missile Developments and Ballistic Missile Threat Through 2015* shows that there is a possibility for up to four additional countries to deploy intermediate-range to intercontinental ballistic missiles in the next few years.[16]

Russia, China, and India are the only countries that have ballistic missiles that can currently reach the United States.[17] But that list is expected to grow in the next ten years. Figure 1 shows potential threat countries and the ballistic missiles that they had as of 2001. Most of the missiles are limited-range Short Range Ballistic Missiles (SRBMs), with ranges of up to 300 Km. But with a little technical knowledge, Iraq welded two Scud B rocket motors together to create the Al Samond missile. Even though the missile only had a payload of 500 pounds, its use as a terror weapon was well documented during Desert Storm.[18]

The third key reason is the potential threats generated by converting Satellite Launch Vehicles (SLV) into ballistic missiles. More than thirty countries have SLVs and space programs that could convert SLVs into to anything from short-range ballistic missiles into ICBMs.[19] Converting a SLV to a ballistic missile is a fairly simple operation in changing the flight characteristics of the missile.

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[15] http://www.odci.gov/nic/other missilethreat1999.html. Downloaded 12/17/03

[16] Ibid. The countries were North Korea, Pakistan, Iran, and Iraq.

[17] McMahon (1997) p 231. NATO and Friendly countries have been omitted from the list. However the United Kingdom, France, and possibly Israel, have ICBMs that could reach US territories.

[18] McMahon (1997) p 57.

[19] Senate Hearings March 11, 2002.

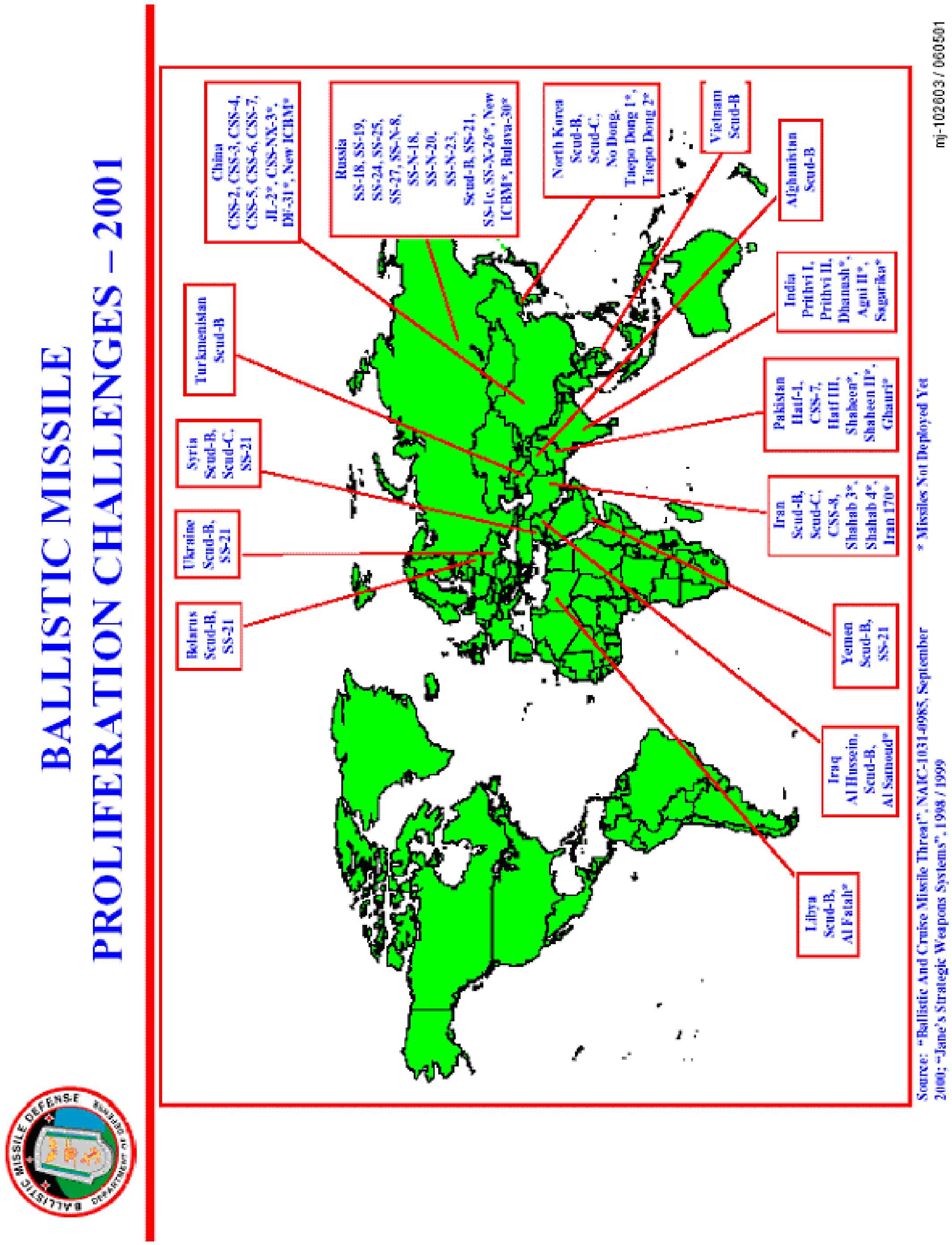


Figure 1 Ballistic Missile Proliferation[20]

[20] Missile Defense Agency. Downloaded 11/3/03 http://www.acq.osd.mil/bmdo/bmdolink/pdf/BM2001.pdf.

### 1. North Korea Ballistic Missile Technology

By altering the burn time of the rocket, trajectory, adding additional payload to slow the assent of the missile to keep it from breaking the Earth's gravitational field, or altering the flight controls in flight. SLV technology, while not exportable by US companies, is generally accepted as peaceful technological application, but with only a little modification it can become a terror vehicle.

North Korea has a missile development program that has produced the Taepo Dong 2, a three-stage medium-range ballistic missile (MRBM). While the exact range of the missile is unverified and a closely held secret of North Korea, estimates place the range at between 4,500Km to 6,000Km.[21] The North Korean's have a robust testing and production facility in the vicinity of Hongwon, North Korea. They have leveraged the technology from the Scud B and C missiles that they acquired from the Soviet Union and/or China to develop the indigenous Taepo Dong line of ballistic missiles.

North Korea is also a leading black market exporter of ballistic missiles around the world. Such exportation is against numerous international laws and UN agreements. The North Koreans are willing to sell these weapons to the highest bidder. In 2003 a North Korean merchant freighter was seized in India with what was reported to be a missile production facility in crates.[22] The final destination of the cargo was most likely Iran or Iraq.

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[21] http://www.odci.gov/nic/other missilethreat1999.html. Downloaded 17 December 2003

[22] Warrick (2003)

### 2. Potential WMD / WME Weapons Payloads

Weapons of Mass Destruction (WMD) and Weapons of Mass Effects (WME) are payloads that would make the investment in long-range ballistic missiles worthwhile for a country. Figure 2 shows that one ton of high explosives would do relatively little damage to a major metropolitan area, aside from the fear factor, unless it happened to score a direct hit on a building. Biological and chemical weapons provide a huge number of casualties per pound of payload. The number of deaths that would result from a ballistic missile with a WMD/WME warhead hitting a metropolitan area could easily dwarf the numbers that occurred during 9/11.

CASUALTY ESTIMATES FOR HIGH EXPLOSIVE AND NBC ATTACKS ON THREE MAJOR CITIES

| Warhead Type | Washington, D.C. Dead/Injured | New York City Dead/Injured | San Francisco, CA Dead/Injured |
|---|---|---|---|
| Conventional (1 ton of High Explosives) | 6/17 | 15/40 | 10/25 |
| Chemical (300 KG of Sarin) | 250-3,800/250-3,800 | 600-9,200/600-9,200 | 400-6,000/400-6,000 |
| Biological (30 KG of Anthrax Spores) | 25,000-100,000/a | 61,000 - 245,000/a | 40,000-160,000/a |
| Nuclear (20 Kilotons) | 50,000/50,000 | 123,000/123,000 | 80,000/80,000 |

a Casualty Rates for Anthrax are not present since Anthrax would kill nearly everyone exposed to the agent.

Figure 2 Agent Use in Ballistic Missile Attacks.[23]

## F. INSTANCES OF POLITICAL INSTABILITY THAT COULD HAVE LED TO A STRATEGIC FIRST STRIKE

While the initial system will not be as robust as subsequent iterations of the BMDS, the critical need for

[23] McMahon (1997) p.192

such a system is clearly warranted. Although the risk of an unauthorized or limited objective attack against the US is low, several crises since the fall of the Berlin Wall have shown the need for a BMDS to defend against the possibility of such an attack. This section will briefly outline three such instances that highlight how an unintentional limited nuclear war between the United States and Russia or the United States and China could have started.

### 1. Tiananmen Square Protests and Chinese Government Reaction

From the initial protests in Tiananmen Square to several months after the violent conclusion of the protests the status of Chinese nuclear forces was unclear to anyone outside the small circle of the Chinese national leadership (Communist Elite). Even with the Chinese government assurances that the internal '*crisis*' would not lead to a coup or a Chinese civil war, the status of the forces was in question.[24] If a civil war had broken out, in to whose hands would the nuclear forces have fallen and what would be the loyalty of those forces. The Chinese command and control system for nuclear weapons is largely a mystery in the West. The Chinese have not published the actual safeguard mechanisms for nuclear weapons, so the world must rely on the Chinese government and military to keep the weapons controlled and impossible to launch without a verified launch order from Chinese national leadership.[25] While it is not argued that it is extremely unlikely that

[24] McMahon (2001) p.121

[25] While not finding a reference that identifies the Chinese government/military safety measure system for nuclear weapons is not a validation that it does not exist; it does represent that there is little knowledge on the subject.

the Chinese government would have launched a first strike against the United States, either side wishing to further their side's political goals by involving the United States in a limited nuclear war could by have used a limited first strike with a few mobile ICBMs to reach a specific near-term objective.

### 2. 1991 Russian Coup Against Gorbachev

During the August 1991 coup in the Soviet Union, the leaders of the coup did gain control of the nuclear command suitcase from Secretary General Mikhail Gorbachev.[26] The Soviet system of command and control for nuclear launch release authority was designed such that only with two different keys could a launch be authorized. One of the keys is generated by the Secretary General, or one of the ranking Politburo members in the absence, or incapacitation, of the Secretary General (the *politica*l launch key), and the other key generated by the Chief of Staff of the service launching the weapon (i.e., Navy for SLBMs, Army for ICBMs, and Air Force for Bomber launch) (the *military* launch key).[27] Neither side in the coup made any move to heighten the state of the nuclear forces or generate a launch key; and all three of the Chiefs of Staff (Army, Navy, and Air Force) all individually, and separately, determined that they would not honor any launch code if the political command key was generated and transmitted.[28] While the Soviet safeguards against inadvertent launch were never truly tested, even the remotest possibility that the safeguard system could have been critically tested raises the following question. Why

[26] Senate Hearing (1991) p.8

[27] Ibid p.11

[28] Ibid p.9

should the United States rely on the Soviet safeguard system to work as our primary means of defense from ballistic missiles?

### 3. 1993 Russian Reaction to Norwegian Satellite Launch

Norway launched a weather satellite in January of 1995. According to documents from the Norwegian government, the Russian Foreign Ministry was advised of the launch and the nature of the satellite launch well in advance of the launch.[29] However, the information provided to the Russian Foreign Ministry was never forwarded to the Russian Ministry of Defense or to the Russian defense command and control centers. If the information was forwarded it was lost at both locations. These command and control centers picked up the launch and incorrectly identified the rocket as an ICBM, possibly a US SLBM, headed for Russia. The crises got to the point where President Boris Yeltsin and the Chief of the Russian General Staff, General Mikhail Kolesnikov had their nuclear command and control briefcases open and were conferring via the Russian Command and Control network.[30] How close was the Russian government to launching a 'retaliatory' strike on the United States? Most Russian and American sources discount the possibility of a Russian response to a single missile, but with the stability of the world in question should not the United States have a Missile Defense system to defeat such a strike?

These three instances of political instability illustrate why the United States should not base defense against ballistic missiles on the aged principle of

[29] Graham (2001) p.212

[30] Graham (2001) p212

'Mutually Assured Destruction.' The development of a ballistic missile defensive system that can protect the United States and the world will prove that the world can be a safer place when so few cannot destroy so many.

# III. DOCTRINE AND THE UNIFIED COMMAND PLAN

## A. NATIONAL DOCTRINE

### 1. National Security Strategy

The latest release of the *National Security Strategy* (NSS) was released in September of 2002. The Bush Administration's original release date for its first NSS was scheduled for the middle of September 2001. The attacks of September 11, 2001 put the publication on hold and forced a major revision of national strategy and the supporting documents in light of the new Global War on Terrorism (GWOT), the shift in America's view of the world, and her focus. The new NSS has made securing the United States against Weapons of Mass Destruction (WMD) one of the nation's top priorities.[31] The road to securing the nation against WMD has multiple fronts, one of which is through the ballistic missile defense system (BMDS).

The NSS of September 2002 first articulated the idea of acting preemptively against terrorists, or governments, that are planning to harm the United States.[32] Preemptive action against threats is a key to helping the BMDS achieve its goal of defending the United States. The C2BMC must allow for directing and supporting preemptive operations as part of the initial development. This support will add a level of complexity to the system, but the C2BMC must provide commanders with a single operational picture with respect to defense against WMD attack. All aspects of missile defense, from intelligence to tracking to crisis operations and preemption must be resident in the C2BMC,

[31] NSS (2002) p.1

[32] NSS (2002) p.6

from the start, in order for the BMDS to accomplish its mission.

### 2. Other National Doctrines

Along with the publication of the National Security Strategy, two other capstone security documents were released. Both the *National Strategy for Homeland Security* and the *National Strategy for Combating Weapons of Mass Destruction* further refine and document the United States' position on WMD use against the nation.

While WMD delivered by ballistic missiles is only one way that the United States could be attacked it is possibly the most dangerous, in terms of casualties and destruction.[33] Therefore one of the main pillars of the defense against WMD is deterrence, as outlined in the *National Strategy for Combating Weapons of Mass Destruction*. This strategy does not specifically call out the BMDS as a devaluing agent for ballistic missiles, but with BMDS deployed the United States will no longer be tied to a massive response to ballistic missile attacks as the only 'defensive' measure.

## B. BMDS AND THE CURRENT UNIFIED COMMAND PLAN

The BMDS and the C2BMC need to integrate into the current Unified Command Plan (UCP) and be flexible enough to change when the national and military command structure change. While overhauls to the structure of US military combat forces are rare, they do happen as the military innovates and modernizes. The most radical changes to the UCP and the basic military command structure have to be approved by Congress, but the President has the authority

[33] McMahon (1997) p.192. Airburst explosions will have the greatest dispersal of both fragments and agents and therefore could affect the largest areas.

to change missions and geographical AORs (Area of Responsibility) with only an Executive Order (EO). The Unified Combatant Commanders (CC) are responsible for all military operations within their AOR, with only a couple of exceptions. Should Missile Defense be one of these exceptions? This chapter investigates the command relationships between the CCs and offers suggestions for command and control within the C2BMC.

### 1. USSTRATCOM

Under the current Unified Command Plan, USSTRATCOM (United States Strategic Command) has the primary responsibility for providing integrated missile defense to the United States and her military.[34] This responsibility ultimately spans many layers of defensive weapons from the PATRIOT batteries that support Army Divisions to the Ground Based Interceptors designed to kill inbound missiles in their cruise phase (exoatmospheric) of flight. This responsibility also includes all the collection assets--ground based, airborne radars, and satellite vehicles--which provide first launch indications and tracking of attacking missiles.

The C2BMC structure will be the responsibility of, and controlled by, Commander USSTRATCOM and as such will require total awareness of all airborne entities worldwide and the ability to integrate pictures from the Joint Battle Management Command and Control (JC2BMC) capabilities group, being developed by USJFCOM (United States Joint Forces Command). To assist USSTRATCOM with this responsibility, command of NORAD has been shifted from USNORTHCOM (United States Northern Command) to a co-command between USSTRATCOM

[34] http://www.stratcom.af.mil/ Downloaded 1/10/04

and USNORTHCOM. NORAD, whose primary mission is the defense of North America against air-breathing entities, also monitors all the objects in orbit and that are launched to orbit. NORAD has played a role as the military command center that could direct military forces after a nuclear first strike since very early in the Cold War. The other command centers capable of directing forces from a hardened and secure site are the National Military Command Center (NMCC), the Alternate NMCC in Pennsylvania, and the airborne command centers (NECAP and TACMO aircraft). The continued use of NORAD for BMDS launch and C2 is a common sense way to limit the cost and integration problems of introducing a new weapons system to the US arsenal.

**2. USNORTHCOM**

Through a Memorandum of Agreement (MOA) with USSTRATCOM, USNORTHCOM is currently designated as the launch control authority for the GMDs that will be deployed. The idea behind the MOA was that the defense of North America was part of the charter of USNORTHCOM and as such USNORTHCOM was the best CC to exercise launch authority over the GMDs.[35] Also, the proximity of USNORTHCOM’s Headquarters to the NORAD Operations Center in Cheyenne Mountain made the chain of command less disjointed. However, USNORTHCOM is not the Combatant Commander that should be responsible for missile defense. That job needs to be performed by USSTRATCOM.

**3. Regional Combatant Commanders**

Although both USSTRATCOM and USNORTHCOM seem to control the national architecture for missile defense, each of the Regional CCs has a Title 10, USC, Section 164 responsibility to defend the United States forces and

[35] Interview with Mr. Caffel (2003)

interests in their AOR.[36] That requirement creates within every CC AOR a missile defense architecture that provides for the defense of US forces and interests. Normally, the missile defense responsibility is delegated to the JFACC (Joint Forces Air Component Commander) for standing Joint Force Structures (i.e., Korean Peninsula) or the Air Force's service component commander for the CC's AOR.

It is possible that two geographically proximate CCs will have to manage the short-range ballistic missile defense laterally across the two AORs. During Desert Storm the defense of Israel was one such instance. Israel geographically belonged to USEUCOM (US European Command) and the main battlefields of Desert Storm belonged to USCENTCOM (US Central Command). The lessons of theater missile defense in Desert Storm will be discussed in detail later. However, this command relationship (difficult delineation between supported and supporting CC) has the potential to 'muddy the waters' with respect to C2BMC launch authority and prioritized defense areas.

The necessary involvement of all of the above mentioned Combatant Commanders in missile defense has increased the complexity of the BMDS and the C2BMC. The next section will discuss how, using existing doctrine, the missile defense C2 can be tailored to increase efficiencies and reduce the complexity of the operations of the BMDS.

### C. CURRENT THEATER MISSILE DEFENSE DOCTRINE

The current Theater Missile Defense (TMD) Doctrine is based, like most operational (offensive) doctrines, on apportionment and pre-planning. The key to TMD against a limited range threat (up to 1000Km, like a Scud or Scud

[36] United States Law Title 10, USC, Section 164

variant) is target analysis from the enemy perspective and possible interceptor positional analysis from the friendly perspective. Placing PATRIOT batteries in line with anticipated launch azimuths creates lines of fire that can reduce TBM effectiveness with limited anti-TBM assets.[37] TMD doctrine places great emphasis on attacking the TBMs before they are used in combat.[38] On the world stage, while preemption is an option, it is not a realistic option for countering all possible first strike scenarios. Therefore the United States must proceed with a good 'in-flight' defense from ballistic missiles.

While the TMD doctrine is good for limited area and regional crises, there needs to be a cogent doctrine for defining the C2 for all missile defenses. Given the possibilities of damage and casualties as shown in Figure 2 of Chapter I, apportionment of missile defense forces against targets no longer makes sense. The US will likely never possess enough missile defense forces to launch multiple interceptors against every inbound missile, so battle management and command and control of the limited resources become increasingly important to the success of the BMDS.

### D. BMDS COMMAND AND CONTROL

There are three distinct layers of missile defense. The first layer and most prolific threat is, as discussed above, Theater Missile Defense and short-range ballistic missiles. The second is medium-range and intermediate-range ballistic missiles, with ranges from 1000Km to 5500Km. This range could affect the entire AOR of a

[37] Joint Pub 3-01.5 p.III-2

[38] Joint Pub 3-01.5 p.I-3

Combatant Commander, and might affect several CCs' AORs. This level can also be thought of as the Regional missile defense arena. The final layer, and perhaps the most dangerous, is ICBM range missiles, which are generally accepted to be missiles that have a range in excess of 5500Km.[39] This layer can also be thought of as the global missile defense layer.

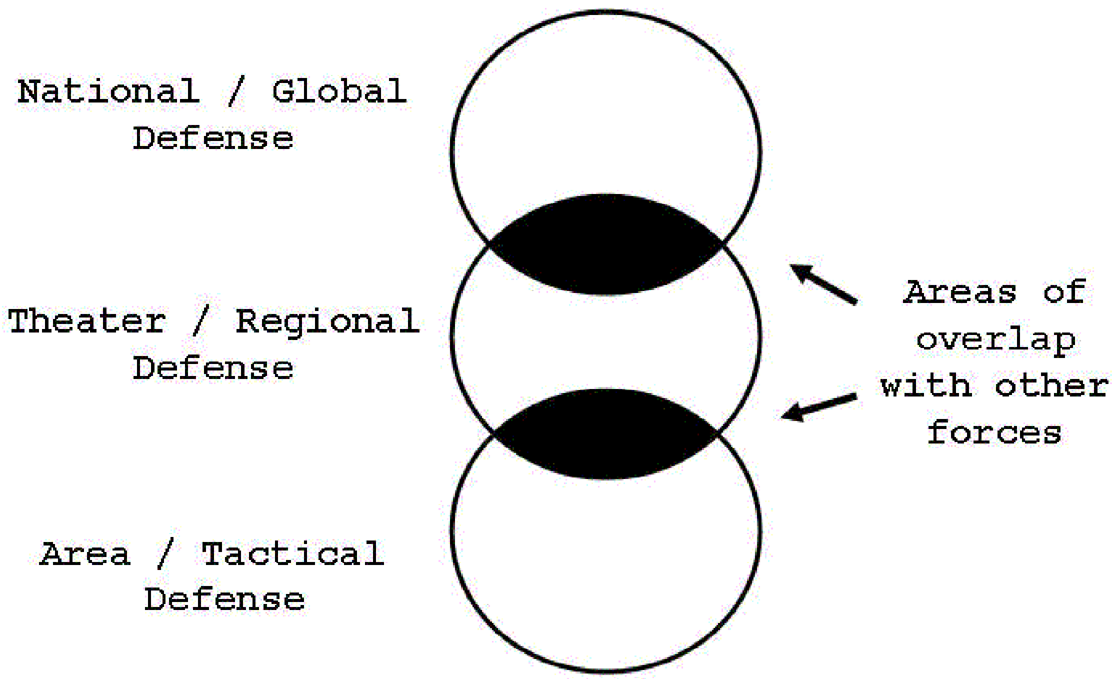


Figure 3 Levels Of Missile Defense C2

Figure 3 shows that each level of missile defense has overlap with the adjoining layer(s). The C2BMC will have to not only direct operations within one layer but all the layers simultaneously. Managing the 'in between' areas, as shown in black in Figure 3, is key to maintaining effective

[39] Siegel (2001) p.15

C2 over the entire BMDS. The use of one type of interceptor vice a different type of interceptor from a different 'level' may determine the long term success of the defense. For example, if too many interceptors were used within one level, the missile defense forces may become depleted of assets and overwhelming the defenses may become feasible for the adversary. So the C2BMC must have the intelligence and missile defense forces operational status (i.e., active sensors, weapons remaining…) necessary to fight the defense in the most efficient manner.

Both Sun Tzu and Carl Von Clausewitz espoused the need for clear chains of command and unified commands where at all possible.[40] 'Unity of Command' is listed as one of '…the bedrock[s] of US military doctrine' within Joint Publication 1 and is defined as follows:

> Unity of command means that all forces operate under a single commander with the requisite authority to direct all forces employed in pursuit of a common purpose.[41]

To elaborate on the doctrinal definition, unity of command helps to eliminate confusion within the forces caused by having more than one commander or having more than one chain of command.

The current design for BMDS C2 as outlined above does not have unity of command as a central characteristic. If unity of command were stressed in BMDS, the Combatant Commander with cognizance over the system would also be the *supported* commander. Some may argue that through the use of technology both unity of command and clear COCs are no longer necessary since technology can overcome span of

[40] Sun Tzu (1963) and Von Clausewitz (1984)

[41] Joint Publication 01 (2000) p. III-7

control problems. But the use of technology has not in the past produced gains in a commander’s span of control. The key to developing C2BMC command architecture is to eliminate the span of control issue by identifying the informational flow and couple that with the appropriate decision making aids and processes to allow for the commander to make timely orders to the missile defense forces.

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# IV. MERGING THEATER MISSILE DEFENSE AND BALLISTIC MISSILE DEFENSE

## A. BMDS AND C2BMC ORGANIZATION

Using the BMDS network configuration developed by the Naval Postgraduate School's BMDS Working Group, each regional Combatant Commander (CC) will have local C2BMC node which will feed into the rest of the C2BMC nodes and receives data from the local sensor network and the local weapons network (See Figure 4)[42]. The local sensor network will also receive data from sensor networks in the other regions. A regional weapons network will not talk to other weapons network, but only to the local sensor network for track information and the local C2BMC node for weapons assignment information. The C2BMC system of nodes will fully communicate between all the C2BMC nodes to maximize weapon assignment efficiency and increase the probability of kill against an inbound ballistic missile and minimize weapon usage.[43] The sensor networks will run largely autonomously sharing data and cueing messages without operator interference. Since all the C2BMC nodes will interconnect, not necessarily by an all-points connection, the system can be run in 'theater' mode where each regional CC will have control of the missile defense within their AOR or the more efficient 'global' mode where command of all the missile defense forces is controlled by USSTRATCOM either through CMOC (Cheyenne Mountain Operations Center, the NORAD Command Post) or some other command post.

[42] For more on the BMDS network architecture see Caffall (2002) and Babbitt and Miklaski (2003)

[43] Babbitt and Miklaski (2003) p.42

Such a regionally designed network in theory could greatly increases the efficiency of the network with respect to missile usage and provides the regional CCs and USSTRATCOM with a mixed use of both TMD and global missile defense assets. This inherent flexibility also allows the command of individual nodes to be shifted, up or down the chain of command, during crises and hostilities. In the remainder of the thesis, it will be argued that the preferred method for C2 of the BMDS will be for a single commander to 'defend' the globe using assets that are positioned in other Combatant Commander's AORs, with advisory messages passed around to the other C2BMC nodes. The back-up method will be for each C2BMC node to operate as an independent missile defense system and communicate its intentions to adjacent C2BMC nodes, and the global command C2BMC node, if possible.

The Government Accounting Office (GAO) report on the development of BMDS states that the human operator granting permission to engage an inbound missile is time-critical.[44] The concept of operations for the C2BMC must assume that the President will grant weapons release authority down the chain of command (COC) to a level appropriate to allow for engagement of the enemy missile.[45] This thesis assumes that the appropriate level is at least at the Combatant Commander level, preferably at the Component Commander level.

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[44] GAO (2003) p 7

[45] Ibid p.7

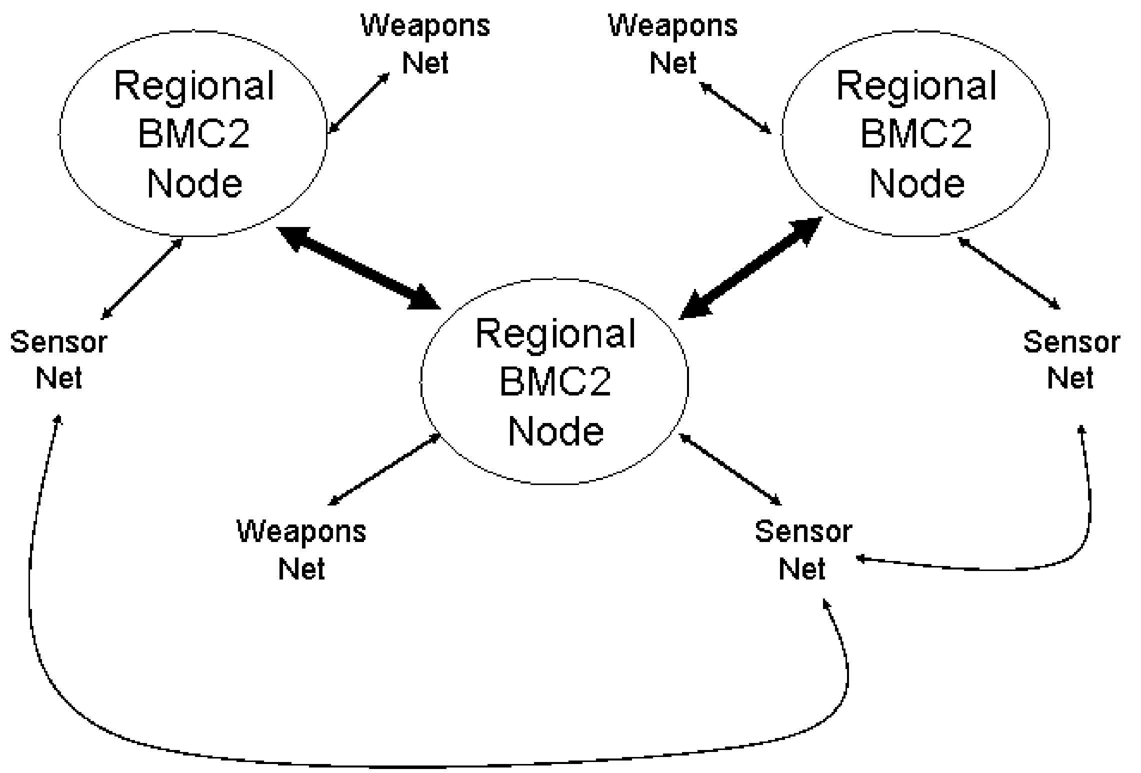


Figure 4 Theoretical C2BMC Sensor Network[46]

Rules of engagement (ROE), a cornerstone to effective high tempo combat operations, must be developed and refined over development of the BMDS. Each of the serial ROE statements must be tested against war game scenarios to validate the ease of use for the rule and the applicability of the rule to various scenarios. ROE can be thought of as the bedrock on which the rest of the BMDS will be built and while ROE can change over time if is paramount that human input into the system is maintained. A well designed and articulated ROE will allow for the delegation of missile

[46] Adapted from Babbitt and Miklaski (2003)

launch authority from the highest levels (i.e, the President and Secretary of Defense) to USSTRATCOM and most likely down to the watch staff of the JTF.

## B. THEATER MISSILE DEFENSE DOCTRINE

Joint Publication 3-01.5, *Joint Doctrine for Theater Missile Defense*, sets the doctrinal bar for how Joint Task Force (JTF) Commanders should employ their forces to defend against enemy ballistic missile operations. Although Joint Pub 3-01.5 includes all missiles types under the same doctrine (cruise, air-to-surface, and ballistic), the concepts for defending against them is the same. While concentration in development of the BMDS is focused on ballistic missiles the same methodology will be used when the BMDS is responsible for countering all missiles.

There are four principal operational elements of Theater Missile Defense (TMD). They are Passive Operations, Active Operations, Attack Operations, and C4I.[47] All of the areas that serve as keys to Theater level missile defense have a direct relationship with similar keys to regional and global missile defense, the two higher levels of the BMDS. The following sections describe each element at the TMD level and derive what that element might entail at the new higher levels of the BMDS.

### 1. Passive Operations

Passive Operations has four principal measures: tactical warning, reduced targeting effectiveness, reducing vulnerability, and recovery and reconstruction. Of these only tactical warning and reducing vulnerability have direct relationships with what needs to be done at the regional and global missile defense. The other three are

[47] Joint Pub 3-01.5 (1996) p.I-3

militarily relevant but difficult to accomplish with the threat missile range and accuracy. For example, there is no way to deceive an enemy about the position of major cities, ports, power grid locations, etc. Reconstruction and recovery will be the job of FEMA and other departments of the federal government, if the BMDS should fail.

Tactical Warning is an element that will be used at all levels of missile defense. In the Theater level of operations the JFC is responsible for a 'theater event reporting system' to disseminate warnings to the military and civilian populations. Both the regional and global commanders will need to furnish the same information to the groups under their protection.

Training civilian authorities and NBC defense forces are key aspects to reducing vulnerabilities. While the BMDS organization or MDA will not directly conduct the training, it will fall to a joint Department of Defense/Department of Homeland Security (DoD/DHS) task force to detect, protect, and decontaminate, if necessary. The BMDS testing results and information about the system will also be crucial in helping create a positive global understanding of the system.

**2. Active Operations**

Joint Pub 3-01.5 as defines active operations in TMD as:

> to protect selected assets and forces from attack by destroying TM airborne launch platforms and/or TM's in flight.[48]

[48] Ibid p. III-7

Defense in Depth is also stressed as a way to ensure that the defending forces have "multiple opportunities to negate" inbounds ballistic missiles.[49]

One of the key tenets of Active Operations is that the operations should be centrally commanded and decentrally executed. This tenet is in keeping with the vision of the *Unified Action Armed Forces Doctrine* and with the realities that the timing constraints often times will necessitate direct launch authorizations from the highest levels of command to the individual batteries or ships. Once the BMDS is fully operational, the element of resource management will become a management issue and only through careful planning and centralized tasking will the system respond to an all-out attack effectively.

### 3. Attack Operations

Attack Operations occur during the hostilities phase of operations. In a TMD role, the easiest way to defeat ballistic missiles is to destroy them while they are on the ground or in garrison. During Desert Storm an enormous number of sorties were generated during the 'Great Scud Hunt.'[50] In the future, the role of the C2BMC will be to act as the intelligence clearing house for ballistic missiles and their launchers. Using actionable intelligence, the number of dedicated sorties for attack operations should be cut by over half.

[49] Ibid p. III-7

[50] Trainor (1995) p. 238. The exact numbers are difficult to assess since the Airborne Command Element (ACE) could, and did, redirect missions airborne, but estimates are that between 2 and 5% of sorties generated from the start of the air campaign to the ceasefire in March were for the 'Great Scud Hunt.' There were over 41,000 sorties total during the 8 week war.

The NSS of 2002 set forth the policy of pre-emptive strikes against enemy forces, but it would be politically difficult to attack a country with ballistic missile launchers outside the hostility phase of a conflict. However, planning for attack operations must be continually updated to allow the RCC and USSTRATCOM the ability to launch into the hostility phase of an operation and be poised to destroy an enemy's ballistic missile arsenal.

**4. C4I**

Current guidance for Command, Control, Communications, Computer, and Intelligence (C4I) within TMD is to use "existing joint and Service C4I systems and resources."[51] Using existing C4I systems may have worked in the past where there were fewer threat missiles in the battle space, but as the numbers of and ranges of missiles increases the C4I systems that support missile defense will have to be dedicated to missile defense. With the timing constraints that missile defense has, it would be unreasonable to require that TMD Command, Control, and Communications (C3) ride on the back of current C3 systems that are generally running overburdened as it is. As mentioned in Chapter II, the BMDS will attempt to hit a missile with a missile. The tracking and sensor data alone would push the military's other C3 systems beyond their capabilities. The C2BMC is the C2 system that is the basis of BMDS, with communications added as a way for the nodes to work together. With the new system to control the components of the BMDS, new architecture and process need to be developed to increase the efficiency of the BMDS.

[51] Joint Pub 3-01.5 (1996) p. III-14

Planning is another aspect of TMD that will lend itself to expansion under the BMDS. The Intelligence Preparation of the Battlespace (IPB) is key to planning for the worst scenario that the BMDS is likely to see. The IPB for missile defense will illustrate what countries have ballistic missiles, the possible targets of those missiles, and the intercept timelines necessary for a successful engagement. The intelligence from the heat signature is then matched to DSP, or its follow-on system Space Based Infrared System (SBIRS), track to allow for rapid typing of the inbound missile and its targeting. The existing TMD Doctrine has little in the way of how to integrate the existing JTF J2 (Intelligence) into the TMD mission. Under the BMDS, Intelligence is critical for the Regional CCs and USSTRATCOM to deploy missile defense forces and defend US forces and civilians around the world as well as the territory of the Untied States.

## C. BALLISTIC MISSILE DEFENSE

Currently the only other country that operates a large missile defense organization is Russia. Russia operates a legacy Soviet missile defense system that is designed to protect Moscow and the surrounding areas from a missile attack. However, using the Soviet system for command and control as a model for the C2 of the BMDS is flawed for the following reasons. The Soviet model for C2 was very rigid and did not allow for any flexibility or originality of thought, had a penchant for KGB involvement in strategic operations, and never aligned itself to a single combined arms model.[52] The old Soviet, now mainly Russian, C2 model and the United States' C2 model have never been truly

[52] Cimbala (1987) p. 35, 157, and 159

compatible and comparison would not be appropriate for the evolving BMDS.

### 1. NORAD's Informational Requirement

North American Aerospace Defense Command (NORAD) was created in the late 1950's to detect and defend the United States and Canada from airborne threats, originally bombers from the USSR. Since its inception, NORAD has been tasked with additional responsibilities, including tracking ICBMs, tracking and cataloguing all space vehicles, and after 9/11 a renewed and increased focus on air traffic within the US. With the threat of ICBM attack from several nations, NORAD has become the national early warning center responsible for directing response options to attacks. With the deployment of BMDS and the realignment of NORAD's echelons above command structure, NORAD will add the responsibility of the global C2 center for missile defense, as well as its current other missions.

Given the history of NORAD, a command developed during the Cold War and one of the executers of the Single Integrated Operational Plan (SIOP), it is no wonder that the level of confidence required of and from information is extremely high. In Pearson's book about the World Wide Military Command and Control System (WWMCCS), he states that there were over 3700 missile display conferences in one 18-month period in the early 1980's.[53] These missile display conferences were held every time that one of the ballistic missile early warning sensors detected anything that could not be typed. With the high reliability that the Cheyenne Mountain Operations Center (CMOC) is responsible for, the granularity of the information needs

[53] Pearson (2000) p.245

to be of almost fire control quality. It will not be enough for the CMOC to receive a track from the C2BMC with the parametric data removed. This level of detail will increase the messaging requirements for the C2BMC, but such granularity is required by the commander, and the staff, when execution of the missile defense OPLAN is required. The missile defense OPLAN will be discussed in Chapter V.

**2. Theater Level Defense**

Desert Storm provides the best example of a well-tested missile defense system; it used modern doctrine, had a reliable C2 structure to pass information and orders, had a dispersed force structure, and was attacked. There have been very few crises that place both ballistic missiles and missile defense agents in the same battlespace, and few crises where ballistic missiles have actually been launched. The other case study that could be used is the Korean Peninsula TMD organization or the TMD organization used during Operation Iraqi Freedom. Since neither of these architectures have been critically tested the efficiency of the systems should be judged as suspect. Also their classifications, due to the ongoing nature of operations, place them outside the scope of this thesis. The next section will use Desert Storm as an example of what theater level missile defense (TMD) according to doctrine could look like deployed and operational.

**3. Global Defense**

The BMDS system will eventually be able to detect, track, evaluate, assign, engage, and evaluate engagement over 5000 tracks simultaneously around the entire globe.[54] It is doubtful that the BMD system will ever have that many interceptors to assign a one-to-one interceptor to missile

[54] Interview with Mr. Caffall 11/16/2003

ratio. However, this number of simultaneous tracks possible shows that the C2 of the BMDS is critical, since at some level the decision may have to be made to engage one target and not another target or to allocate two or more interceptors against one target and not another. The ability to manage this conflict will have to be centrally located to best devise how the missile defense battle should be fought. As previously discussed, the speed of the decision making will also have to be so quick that decisions will have to be self-evident (i.e., ROE built into the C2BMC displays to allow the operator to increase decision speeds). Centralized control and decentralized action has been clearly articulated in the current TMD doctrine.

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# V. DESIGN OF THE BMDS COMMAND AND CONTROL ARCHITECTURE

As discussed in the previous chapters, the fundamental key to command and control for the BMDS and specifically the C2BMC is flexibility and adaptability. The flexibility in the system must be designed from the ground up. USSTRATCOM, the overall commander for global missile defense, needs to be able to use the system in a number of different ways. From the highly centralized manner where all interceptor launches are assigned and authorized from STRATCOM Headquarters (or possibly the CMOC) to a highly decentralized 'Weapons Free' mode where every missile defense agent has the authority and responsibility to take a shot at any ballistic missile that is in range of their interceptors.[55] The 'Weapons Free' mode would be an extreme scenario, so it is important to allow the commander to tailor the BMDS system as necessary and for all eventualities. The best and easiest way to manage a system that will be as complex as the BMDS is to allow extensive flexibility in command and control.

## A. COMMAND RESPONSIBILITIES

As designated by the President, the Commander USSTRATCOM has the overall responsibility for global missile defense. Whether or not STRATCOM is the supporting or supported command in that role is still to be decided, but to achieve the C2 necessary to successfully intercept missiles, USSTRATCOM should be the *supported* commander.[56]

[55] 'Weapons Free' is defined as any contact not positively identified as friendly must be engaged by US/Allied forces if those forces are able to engage.

[56] JP 1 and JP 3-0, chapters II and III, have good discussions on supported and supporting commands as it pertains to Unity of Effort.

By granting USSTRATCOM the role of *supported* Combatant Commander for all aspects of missile defense, it will allow a single staff organization the duties of planning and reviewing supporting commanders' plans with respect to missile defense. All geographic CCs will have a theater plan that will propose positioning of forces to best detect and interdict short- to medium-range missiles based on guidance provided by the USSTRATCOM staff that will be able to merge all the theater and regional plans into one cohesive global plan. These plans will have to be developed prior to the execution of any intercepts. The Joint Staff has created a process that produces plans for likely scenarios; that process is called joint operations planning. Joint operations planning consists of two planning processes, the deliberate planning process and the crisis action planning process.

### 1. Deliberate Planning

USSTRATCOM will be tasked by the Chairman Joint Chief of Staff (CJCS) to provide Operational Plans (OPLANs) and Concept Plans (CONPLANS) to the Joint Staff that show how the BMDS will be used against the highest possibility threats.[57] This deliberate planning process will allow all the CCs to review, comment, and help solidify STRATCOM's plan for attack operations, active and passive operations. The OPLANS generated will primarily deal with intercept geometries, detection plans, and interceptor launch windows for threat ballistic missiles from adversarial countries

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Just as a JTF can and will designate supported and supporting roles the NCA through the CJCS will designate them for cross and multi CC relationships.

[57] JP 5-0 (1995) p x. Chapter III of JP 5-0 has a complete description of deliberate planning, what is involved with a OPLAN/CONPLAN and what the Joint Staff requires from the CC.

thereby allowing for smoother control of missile defense forces during times of crisis and while under attack.

### 2. Crisis Action Planning or Operations

Crisis Action Planning (CAP) will normally not be applicable to missile defense. The reason is that the CAP process is designed to be a necked-down version of the deliberate process that takes hours or days vice months or years.[58] Missile defense is not measured in days or even hours. Rather, it is measured in minutes and seconds. If there is not a solid plan as to how to engage a missile, the duty will fall to the C2BMC watch staff to fight the US, and possibly allied, missile defense forces against the threat. If there is not a specified OPLAN for a missile defense event, then the reactions becomes procedural-based from the baseline engagement and little extra human involvement will be needed or desired.

Both the deliberate planning process and the CAP are designed to produce plans for force movements, force positioning, and possible engagements. Missile defense is unique in that the forces need to be in place prior to advent of hostilities. So decisions to deploy missile defense forces will have to be made well in advance. If a particular intercept has not been pre-planned (e.g., geometry, type of missile, intended targets) and pre-deployed for, you will have to 'fight with what you have on hand.'

[58] JP 5-0 (1995) p. III-10. The deliberate planning timeline is between 18-24 months per plan and crisis action planning can be done in as little as 8-12 hours for a small reaction force strike or special operations event.

## B. C2BMC AS A C2 ENABLER

Timing in missile defense is everything. Not since the advent of the airplane has the tempo of operations increased to such a degree. The Clausewitzian 'Fog of War' as it applies to the ability to command forces in the field has always been an obstacle for effective employment of forces. The C2BMC will need to provide the commander, the commander's staff, the supporting CCs, the supporting CC's staffs, and the forces in the field a common missile defense picture. The C2BMC will have to provide an array of information that is unprecedented. If the C2BMC can provide the correct picture to the correct operator, the system will be performing its job superbly.[59] The problem however is to provide enough different displays that can be molded to allow for efficient human interaction without making the overall system cumbersome.

There is a huge effort on-going within the defense establishment to create a baseline for interoperable situational awareness pictures. These interoperable pictures, or displays, will provide 'shared' Situational Awareness (SA) between all the forces increasing lethality and decreasing own forces vulnerability. The Navy's Cooperative Engagement Capability (CEC), the Army's Land Warrior project, the Air Force's Theater Battle Management Core System (TBMCS), and the USJFCOM effort to merge all these programs, plus all the current military data links, into a single system (JC2BMC) show the potential of

[59] Johnson et al (1989) p. 60. By 'correct' I refer to the idea that an individual will have little time to sort through several different types of displays to discover the one piece of information that is necessary for optimized use of their particular missile defense system. The Commander USSTRATCOM, the THADD operator in field, and the GMD operators will all have different information needs, hence different display options as well.

eliminating, or at least reduce, the 'Fog of War.' The C2BMC must also be part of this merging of pictures to ensure that C2BMC is not relegated to the periphery of the military.

## C. CREATION OF OVERARCHING MISSILE DEFENSE DOCTRINE

### 1. Desert Storm Architecture and Lessons Learned

During Desert Shield, the buildup to Desert Storm (DS), PATRIOT missile batteries were deployed from EUCOM AOR (specifically from West Germany) to Saudi Arabia, and later to the outskirts of Israel's two major cities. This deployment created the first co-Combatant Commander missile defense architecture deployed and created. While in the Cold War planning and strategy, this co-CC relationship was the exception to the rule. After the Cold War having two, or more Combatant Commanders involved in a crisis seems to be closer to the new rule.[60]

Much of the foundation of theater missile defense doctrine was developed as a result of the lessons learned from the employment of the PATRIOT batteries during Desert Storm. While the success or failure of the PATRIOT batteries to defeat the relatively slow-flying, short-range Scud is debatable, the C2 that allowed the information to be passed from the overhead satellites to the individual batteries in only a couple of minutes is not debatable. The C2 architecture used worked well during Desert Shield/Desert Storm (DS/DS).

Here is a trace of the C2 that allowed the coalition to conduct military operations with little regard for the 'terror weapons' as General Schwarzkopf called the Scud

[60] Priest (2003) p.73. As described in Chapter II the world hot spots, with the exception of the Korean peninsula, seem to be straddling boarders of CC AORs.

missile being launched from Iraq.[61] The DSP satellites were maneuvered to be able to detect launches throughout USCENTCOM's AOR. At the time of DS/DS, there was not a direct feed from the satellites to any CC AOR. Even EUCOM who was the most likely candidate for a short- to medium-range ballistic missile attack had to rely on information being forwarded from the US.[62] JTAGS (Joint Tactical Ground Station, fielded in early 1997) was developed as a result of this lesson learned in TMD. The DSP signal was sent from the ground station in Colorado to the AOR by a double satellite bounce.[63] After the signal was received by the Combatant Commander's HQ the signal then had to be rebroadcast to the batteries in the field that might be able to intercept incoming the Scud.

One of the problems of the system was that the information was passed by voice once it got to the AOR. C3 (Command, Control, and Communications) has improved greatly since the early 1990's and now that JTAGS is a deployable unit the information can be passed via JTIDS (Joint Tactical Information Distribution System) directly from the JTAGS unit to the PATRIOT batteries, which reduces both time to deliver the message and errors in voice reporting.

C2BMC can improve the existing relay of information from the sensor to the shooter by incorporating the existing weapons platforms into the applicable nets. Also,

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[61] Gordon (1995) p.235

[62] Ibid p. 235

[63] Since the distance between Colorado and the Desert Storm AOR (Saudi Arabia and Israel) was so great, a single satellite bounce would not interconnect the two. Nominally the first bounce would have gone from the US to Central Europe, using a GEO satellite and then re-bounced off another GEO satellite to CENTCOM's AOR. Latency of the signal would be nominally less than 2 seconds from original transmission from the DSP ground station to the CCHQ.

by passing digital track and cueing data between platforms the accuracy of the data will be maintained throughout the kill chain.

### 2. False Alarm Rate

The three-layer model; global, regional, and theater level missile defense that was introduced in Chapter II has a problem when a single false alarm rate is applied to the entire system. The timeliness of information is critical to the two lower levels of the missile defense model. The decision timing of the intercept for a short- or medium-range ballistic missile intercept is such that the interceptor must be launched within two to three minutes of the first detection of the inbound or the missile will be out of parameters for a successful intercept.[64] NORAD's role in national defense necessitates highly reliable data be delivered to national leaders at the expense of overall timing.[65]. The use of multiple false alarm rates within one system is not as large a problem as it might seem. If all the systems have the same data, shared over the Sensor Net, the different levels can apply different rules to initiate actions. So while the National level is awaiting a refined launch and impact points for the ICBM raids, the lower two levels can be working on firing solutions and launch on SRBMs and Medium Range Ballistic Missiles (MRBMs).

The Theater and Regional levels of the BMDS would need to use cueing data from the sensor network to help the onboard radar systems on the PATRIOT, THAAD, and AEGIS systems. These platforms would have to compute a 'local'

[64] Interview with Mr. Caffall 11/16/2003.

[65] Pearson (2000) p.245

track before the system would allow for interceptor launch, in current system implementations. So these systems could accept a significantly higher false alarm rate, and can even help in refining flight data for the higher levels.

The use of a GMD against any target would be a serious matter and would require high level of assurances to release the interceptor. Therefore, the false alarm rate for the C2BMC at that level has to be almost zero. However, the sensor network could maintain a higher sensitivity to ensure there were no untargeted ballistic missiles or missed detections. The problem of missed detections would also need to be studied to ensure that the system maintained a zero missed detection record. The low false alarm rate has to be balanced with a fast track development speed since SLBMs would give the system almost no time to react since they use depressed trajectories and are much closer to the potential targets.

### 3. JFACC or JFMDCC

The JFACC is the component commander that is normally assigned the responsibilities of planning and directing execution of TMD.[66] While it is logical to assign the JFACC these responsibilities, it has always been a secondary role for the JFACC and its staff. In the future, missile defense actions and responsibilities will expand as the threat does. The duties of the JFACC staff with respect to missile defense will easily exceed the resources and talents of the JFACC staff. While adding to the JTF organization could be a large step in redefining the way the American military fights our wars, the need for a JFMDCC (Joint Forces Missile Defense Component Commander)

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[66] JP 3-01.5 p. III-11

type of command will arise at either the theater level or regional level.

The need for a separate missile defense organization has been shown in Chapter IV. In fielding the BMDS and the C2BMC, MDA has determined that using existing C2 communications 'pipes' will not allow for the responsiveness required to effectively manage the missile defense assets and defeat incoming missiles, whose targets may number in the hundreds. By fielding the C2BMC, the door is open to allow a direct chain of command (COC) for missile defense from the highest levels (USSTRATCOM) to the individual batteries in the field. While the Title 10 responsibility of the CCs to defend their troops has not diminished, the reality of the timing and decision speed of missile defense necessitates the use of a dedicated COC to allow for timely and accurate engagements. USSTRATCOM should be the commander for missile defense and NORAD should act as the national executive agent for operational missile defense.

Having a Functional Combatant Commander operate within a geographic CC AOR is not entirely without precedent. Recently, United States Special Operations Command (USSOCOM) has been given the authority to conduct 'Special Operations Missions' in a geographic AOR using Special Operations Forces (SOF) teams while under the operational control (OPCON) of United States Special Operations Command (USSOCOM).[67] USSOCOM's leeway in conducting operations would be similar to USSTRATCOM operating and commanding missile defense assets within the geographic area of another CC. The ability for the United States military to

[67] Scarborough (2003).

create a few staffs that are focused on missile defense will also allow the military to more easily provide personnel and train these staffs. This cadre of personnel can be highly trained and routinely exercised to help maintain the force readiness levels necessary to ensure that the human aspect of missile defense can perform as well as the computerized part. Just like the Missileers of the Air Force, missile defense personnel can create their own functional area and devote their entire career to missile defense.

# VI. ALTERNATIVE MISSILE DEFENSE CHAINS OF COMMAND

The role of the overall missile defense commander (or coordinator, depending on the Combatant Commander supported/supporting relationships) and the command and control that can be exerted cannot be downplayed, as the goal is to destroy 100% of the inbound ballistic missiles before they can inflict damage on their targets. This chapter proposes three different chains of command to solve the command and control problem for the BMDS. While any of them will provide adequate C2 for the system, the one that stands out in terms of speed of command and flexibility should be selected to provide the best possible defense for the nation.

## A. THE KILL CHAIN

The kill chain that MDA is using to illustrate the process of engaging a ballistic missile was most clearly articulated by Dale Caffall in his March 2003 thesis for the Naval Postgraduate School. The steps of the kill chain are: surveillance, detection, tracking, identification of targets, targeting weapons/engagement, and kill assessment.[68] Command and control plays an important role in each and every one of the steps of the kill chain. The ability of the missile defense organization to adapt to the new thinking in C2 will either help or hinder the missile defense effort.

## B. CURRENT CONVENTIONAL DOCTRINAL CHAIN OF COMMAND

Figure 5 shows how current conventional military doctrine would align missile defense forces for command and control. The origination of the orders can come from any

[68] Caffall (2003) p. 20

of the echelons above commanders, who have the information necessary to order a launch. Organizing the missile defense C2 in this fashion will promote familiarity within the military for a smoother introduction and development. This organization would be quick in issuing orders in a small crisis environment where all the needed information could be developed within the AOR.

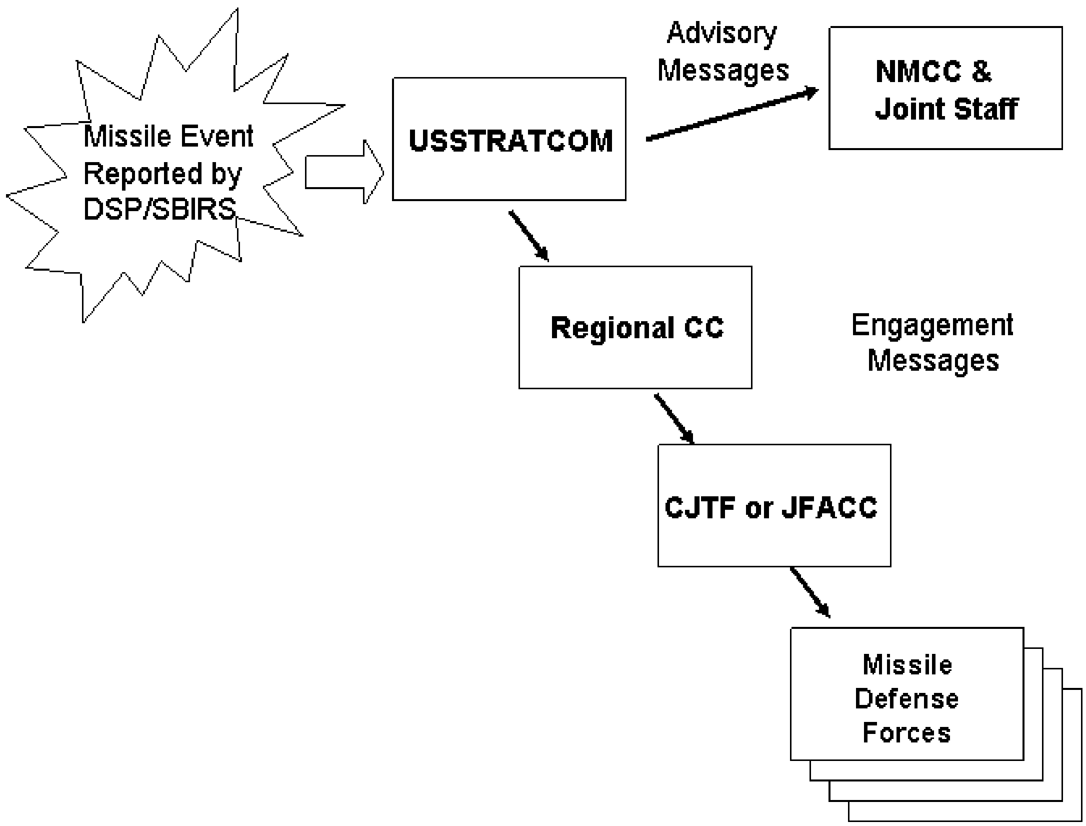


Figure 5 Current Doctrine Chain of Command

The number of links required to be exercised in the chain of command would be a burden to the overall speed of command. In the past several decades when speed is of the essence, the military's command and control system has failed both the national leadership and the military forces charged with carrying out the mission.[69] David Pearson's book gives three examples of instances in which the number of links failed to give the deployed forces their orders in adequate time. The seizing of the *USS Pueblo*, the EC-121 shoot down near North Korea, and the attacking of the *USS Liberty* are all instances of orders being issued but not reaching the units until too late.[70] While it is true that all of these instances of slow command and control happened well over twenty years ago, the underlying reasons for the slowness with passing orders (time to absorb the meaning, inform superiors, ensure compliance, and redistribute them to lower echelon units) still exists in the military today.

While every step in the chain of command has in the past given on-scene commanders a greater authority and responsibility, missile defense is a different kind of warfare. Missile defense requires large amounts of situational awareness to effectively manage and fight. A regional CC has the staff to manage a single conflict within their AOR, and even then the Commander's Staff will most likely be augmented by others staffs or reserve components. Creating a small cadre of personnel who run the TMD organization is within the staff's capability, but the Operations staff (J3) and Intelligence staff (J2) requirements of even a relatively low complexity ballistic missile defense structure will overwhelm the regional CC's staff.

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[69] Either the World Wide Military Command and Control System (WWMCCS) or the Global Command and Control System (GCCS) both have significant delays in disseminating orders.

[70] Pearson (2000) p. 71-91

## C. COMPRESSED CHAIN OF COMMAND FOR REGIONAL COMMANDERS

As stated in Chapter III, the regional US Combatant Commanders have a US Title 10 responsibility to defend the US forces and interests within their AOR. The regional CCs, if given the option, would have the missile defense forces to answer to their combat watches at their headquarters. For the compressed COC to work, the regional CCs must be persuaded that the battle can better be fought from a centralized watch center. The proposed compressed, or hybrid, chain of command (shown in Figure 6) shows that the missile defense forces could have two commanders. Each of the commanders would be intimately involved with fighting at least two levels of the missile defense battle, with the probability of overlap of authority between the commanders. While this overlap may seem advantageous from the point of view that more oversight might result in fewer missed events, it is counter to both unity of command and unity of effort. These two principles of war should be viewed as a basis for how the United States military should operate in the future.

For the co-commander relationship to work, the common operational picture (COP) must be fully developed and fielded. Unfortunately, a 'truly' common operational picture is still an uncommon fact of warfighting.[71] To that end the proposed chain of command would unfairly pull the missile defense units in two directions and increase the command and control aspect of an engagement. USSTRATCOM

[71] USJFCOM is working hard to make the Common Operational Picture (COP) a reality, but the number of different data links, reference origins, and time stamps currently prevent a totally fused picture for any BM or C2 picture larger than a few units or a single service component (for example a Carrier Strike Group (CSG) can manage its own air/land/sea picture, but the picture becomes 'muddied' as soon as another link is introduced).

needs to be able to provide information, support, and control to all missile defense forces per the UCP, and each of the regional CCs has a vested interest in the battle taking place in their AOR. It should be stressed that for USSTRATCOM to fully support the regional Commanders they have to be supportable. As discussed in Chapter V, the regional CCs would have a difficult time managing their own missile defense, both from an organizational perspective and from a personnel perspective.

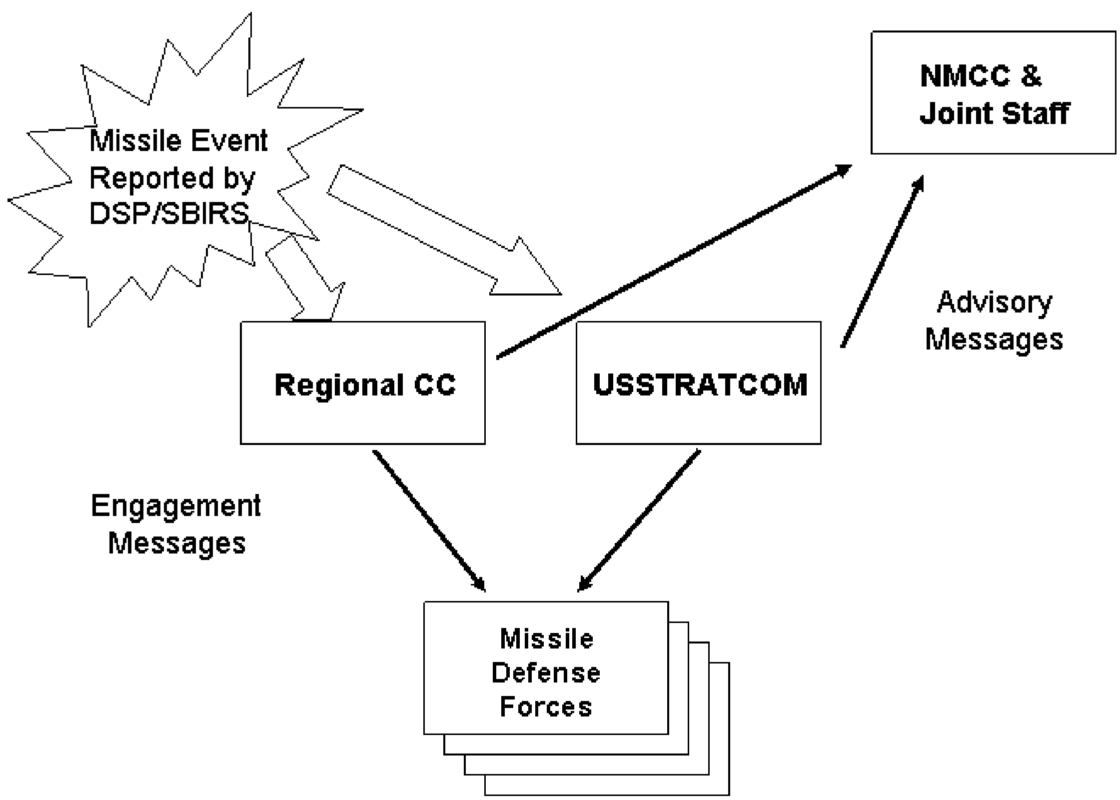


Figure 6 Compressed Chain of Command

## D. FLATTENED CHAIN OF COMMAND FOR MISSILE DEFENSE CHALLENGES

By applying the lessons from Desert Storm and use of SOF during the Global War on Terrorism (GWOT), an increase in the efficiency and lethality of the missile defense forces can be created by eliminating several links in the chain of command (see Figure 7). Advisory messages would act as a bridge to the regional CCs to inform them of launch orders for their AOR; these same advisory messages would keep the national leadership aware of the progress of the battle. Within this 'flattened' organization there is stillroom for national leadership or the regional CC to issue counter-orders if they have additional information or intelligence that has not yet reached USSTRATCOM. USSTRATCOM, and its backups, act as the single point of contact for missile defense.

The flow of the chain of command will be quick and efficient to allow for follow-up launches for second, or even third, chance intercepts. When a sensor registers a missile event it will be fed into the BMDS sensor network and the C2BMC network. USSTRATCOM will evaluate the type of missile and its trajectory to assign an interceptor to eliminate the threat the quickest, with the least amount of collateral damage possible, and with an appreciation of the consequence management from the debris field. The launch order will be transmitted from the USSTRATCOM command center directly to the launch unit. Thereby saving precious time that might allow for a follow-up shot against an incoming missile.

This chain of command will not negate or lessen the unit commander's inherent right and responsibility for self-defense. If a unit operating in the field completes all portions of the kill chain without external support, it is still that unit's obligation to engage with all means available to destroy the incoming missile or if unable to pass the target to a unit who can destroy it.

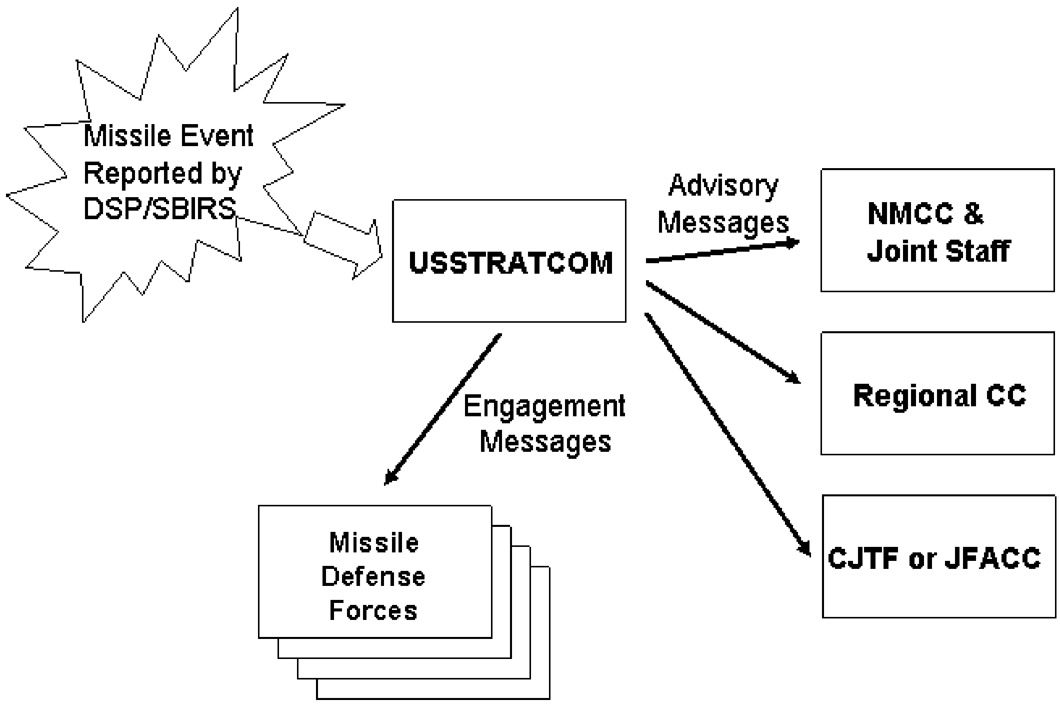


Figure 7 Conceptual 'Flattened' Chain of Command for Missile Defense Forces

Flattening of a command or organization is a relatively new business concept that allows for greater horizontal communication within an organization. There has always been a great deal of military work that has been done across military units at the action officer level (i.e., the military action officers would solve problems and coordinate amongst themselves before problems had to be elevated to the higher echelons of command). This flattening is more of a way for the commander to increase the span of awareness necessary to allow for better decision-making and resource management decisions to be accomplished in the necessary time during a missile defense event.

This flattened chain of command for missile defense can already be seen in the deployments of the Ground-Based Midcourse Defense interceptors (GMDs) to Alaska. The C2 for the GMDs will most likely be hardwired to all of the national command centers (i.e., NMCC, CMOC, and USSTRATCOM HQ), which can already be viewed as a flattening of the conventional chains of command. This C2 arrangement for the GMDs should be used as an example of flattening that could occur throughout the entire BMDS.

### E. SUMMARY

The three chains of command, the conventional, the hybrid, and the flattened, each provides a different and varied approach to command and control. As stated at the start of the Chapter each COC will enable the military to fulfill it mission with respect to missile defense and protect the US. However, in the opinion of the author a decision to move to a more centralized C2 structure, in the form of the proposed 'flattened' CoC, is based on several assumptions that have been presented earlier in the thesis. These assumptions are:

1) Turn-around time from one layer of the CoC to the next adjacent lower level is too long to allow for time budgets to be met.
2) A centralized commander may have a better overall picture of the battlespace and be better equipped and staffed to most efficiently fight the battle.
3) The deployment of the GMDs in Alaska is, to an extent, the CoC is already being flattened.

# VII. CONCLUSION

## A. PROBLEMS IN MISSILE DEFENSE

The complexity of the system that MDA is designing, and the military will field, is without parallel; by limiting human interaction the system-of-system will have to be a mostly self-regulating system-of-systems. The US's Strategic Defense Initiative (SDI) failed in the late 1980's because of the complexity of the undertaking. Technology, in both aerodynamics and computers, has evolved greatly in the intervening two decades between the failure of SDI and the development of BMDS, but the risk of failure remains. To mitigate some of the risk in the BMDS, the C2 system must be adaptable, flexible and robust. The ability to hit a missile with a missile has been proven, but only in a sterile test intercept environment. The challenge for the BMDS will be to launch the interceptor in time to make the intercept; that duty is classic command and control and will be the job of the C2BMC.

All the proposed missile defense chains of command will require an entirely new communications suite to handle the bandwidth requirements of the BMDS. The targeting data alone would stymie most of the military data links now in service; when the C2, intelligence, and other data sets necessary are added to the system requirements the amount of bandwidth is unparalleled in the military today.[72] While great leaps in communications bandwidth and processing power have been realized in the last decade Joel Babbitt and Mike Miklaski, in their 2003 Naval Postgraduate School Thesis, lay out the need for a dedicated communications

[72] Babbitt and Miklaski (2003) p. 15

system for missile defense, which was briefly described in Chapter IV. For the speed with which orders, track data, and kill assessment need to flow for missile defense to be effective organizational changes alone will not work. For BMDS to truly be effective a dedicated C2 system, the C2BMC, and a new organizational structure both need to be deployed. This new communications suite, part of the C2BMC, will also lead the TMD Doctrine away from the 'ride on the back of existing C4I' paradigm to a contained system that will provide for its own commands and intelligence. In certain circumstances, a regional commander will be supporting USSTRATCOM by protecting STRATCOM assets (radars and MD batteries) while STRATCOM is supporting the regional CC with a missile defense shield.

## B. AREAS FOR FURTHER STUDY

This thesis is limited in scope to doctrine and a more abstract analysis of command and control in missile defense. The ideas presented here need to be further quantified and compared in a more technical way, for each of the COCs to be of increased value to the military and governmental decision makers that will ultimately decide who will lead and fight the BMDS. The idea of more co-Combatant Commander coordination and warfighting is a rich area for research and discussion not only for missile defense, but defense in general.[73]

A big question that still is largely unanswered is a political analysis of consequence management. It is feasible to figure out how much damage, both short and long

[73] Coordination was used, instead of C2, to indicate that each may chose to fight their respective AORs differently, but that each would be dependant on the others for early intercepts to increase the probability of terminating the missile flight before consequence management becomes an issue for US and friendly nations.

term, will be caused by falling debris that result from an intercept, but the political ramifications to such an event could be explored in seminar style wargames or other interactive gamming styles. As discussed, consequence management will be a driving factor in intercept approaches for who ever fights the missile defense organization.

## C. RECOMMENDATIONS

Military doctrine for missile defense will have to be rethought and rewritten once BMDS becomes operational. The TMD and Global Missile Defense doctrines should be merged and one doctrine for missile defense should be produced as an example of the joint warfighting capability of the United States military.

As stated in Chapter 1, the assumptions and constraints of the model will change and as they change the recommendations must also change. For example, if the bandwidth to transfer all the track data to a centralized command node were unavailable the flattened command structure would not be advantageous. The centralized command could not then handle all the data necessary for a global picture; therefore there would not be a unity of effort gained through unity of command.

Missile defense effectiveness cannot be measured by how effective individual components are in a sterile testing environment, but rather how well they perform together during a national crisis. The lynchpin holding BMDS together is the C2BMC. Without the C2, the system would be able to float from under to over engagements throughout the globe (everyone passing up a shot thinking that someone else has a better shot to everyone shooting at everything, both situations are undesirable). An adversary could then calculate when the US would have expended its resources in a given area, and then the adversary could easily target an area to breech the defenses and claim victory. To help in avoiding that the C2BMC will have to be robust enough to handle a myriad of different user types, so flexibility and adaptability within the C2BMC is critical.

Chapter VI laid out three different approaches to tackling the missile defense chain of command issue. All three COCs have their unique advantages and disadvantages depending on your point of view. The conventional or hybrid COC might look appealing to the regional CC's and allies and the flattened COC might look appealing to USSTRATCOM, CJCS, SECDEF, and possibly the National Security Council and the President.

The flattened COC is quite possibly the leader in positive transformational capabilities that are presented to the warfighter, but further research is necessary to validate the claim of increased responsiveness, increased robustness, increased flexibility and improved decision-making speed. The ultimate decision as to how to structure missile defense will not be made by an officer in the military, but will be made at the highest levels of the Executive Branch, most likely in consultation with Congress. The military should look beyond the current structure of the regional Combatant Commanders and provide the decision makers with an organization that is flattened and that can complete the kill chain fast enough to protect the United States.

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