

Joint Theater Air and Missile Defense – A Call for a Joint Headquarters

MCWAR 1998

Subject Area Aviation

Joint Theater Air and Missile Defense — A Call for A Joint Headquarters

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1 May 1998

Submitted iii Partial Fulfillment
Of the Requirements for the
Marine Corps War College
Marine Corps University
Marine Corps Combat Development Command
Quantico, VA 22134-5067

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE 1998		2. REPORT TYPE		3. DATES COVERED 00-00-1998 to 00-00-1998	
4. TITLE AND SUBTITLE Joint Theater Air and Missile Defense ? A Call for a Joint Headquarters				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Marine Corps War College, Marine Corps University, Marine Corps Combat Development Command, Quantico, VA, 22134-5067				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

ABSTRACT

Our National Military Strategy calls for a Joint Force capable of providing full dimension, multi-layer force protection. We must execute this capability today in a deployed theater of operations and be prepared to execute this in 2010 and beyond. This is the mission of Joint Theater Air and Missile Defense (JTAMD) and within the JTAMD structure the mission falls upon the Area Air Defense Commander (AADC). JTAMD is an extremely challenging and demanding joint and combined operation. It requires detailed planning and execution that is a focused effort across the services. Successfully defeating tactical ballistic missiles (TBM) and cruise missiles (CM), attacking launch sites and infrastructure, and conducting passive defense requires joint forces who are linked by an intricate Command, Control, Communications, Computers and Intelligence (C4I) structure and under a single commander. The key to success is an AADC that can effectively employ the C4I structure to plan and execute a joint air defense plan that supports joint and combined operations at strategic and operational levels.

I believe the AADC must be clearly designated by joint doctrine and named far in advance of the establishment of a JTF. This is necessary because of the complex requirements for C4I and the challenges of operating in a joint/combined environment. Requirements include extensive planning, coordination, exercising and establishment of habitual relationships between the supported, supporting and combined force to maximize effective integration of all available capabilities. Based on these requirements there exists a broader requirement for a single service or standing joint organization tasked with the mission of JTAMD. Effective JTAMD is no longer a capability that can be dominated by a single service. The successful integration of service contributions to form a JTAMD force is tantamount to mission success.

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Chapter 1

Introduction

Our National Military Strategy calls for a Joint Force that is capable of providing full dimension, multi-layer force protection.¹ Inherent to this mission is the ability to defeat a wide range of threats to include Theater Ballistic Missiles (TBMs), Cruise Missiles (CMs), Unmanned Aerial Vehicles (UAVs) and Weapons of Mass Destruction (WMD). Today we must provide this protection in deployed theaters of operations while we continue to prepare for the evolving threats of cruise missiles and longer-range theater ballistic missiles. Joint Vision 2010 describes the framework for our future threat challenges.

- *The diffusion of technology and proliferation of theater ballistic and cruise missiles will increase the vulnerability of US and allied military forces in theater and jeopardize access to ports and airfields.*
- *The diffusion of technology and information will accelerate, increasing interaction across national borders. New applications of advanced technologies will outpace governmental attempts to regulate their use. In support of economic and political agendas, developed countries will export advanced technological systems, including weapons.*
- *Advanced technology weapons, platforms, and sensors will significantly increase the capabilities of some military forces. Potentially, the US could face parallel military challenges in different regions at roughly the same time.*
- *Generally, military forces in the developed world will be smaller but more capable and better trained. Some states will rely on asymmetric capabilities—such as ballistic and cruise missiles, man-portable air defense WMD and advanced space capabilities.*
- *Weaponry will become more portable and lethal. Military forces will increase their mobility, complicating US and allied targeting.²*

Future threats from the air will not come from organized air forces, but from unmanned weapons with greater accuracy and capabilities. Future theater missiles, tactical ballistic missiles

and cruise missiles will emerge as the "poor man's air force of the 21st century". Joint Theater Air and Missile Defense (JTAMD) forces are necessary to defeat these future threats. Unfortunately, both current and proposed doctrine and structure do not provide the nation with the best recipe for success. JTAMD is not a "piece it together on the ground type of operation" but requires detailed planning, integrated C4I and realistic peacetime training. It will be imperative that within the JTAMD structure mission responsibility falls under a single commander and that commander should be the Area Air Defense commander (AADC). The JTAMD mission area spans all levels of war and the systems that perform the JTAMD mission must be included in all force packages. Future reductions in force structure require an effective JTAMD force that can operate across the total spectrum of conflict. Additionally, to defeat the emerging threats JTAMD must be an integrated part of the development of a national missile defense capability for the 21st century.

I envision that the nation will be required to deploy a flexible JTAMD force as battalion, squadron or single ship task force with strategic missions. This force may operate as a part of a larger theater force or may actually deploy as a small JTAMD JTF. This was done when NATO and the US deployed a combined Dutch/US Patriot force (battalion size unit) to provide population protection and to keep Israel from entering the war during Desert Storm. While not called an AADC, the senior commander on the ground filled the role (O-6 level), without a US JFACC assigned. Most recently (1998) JTF Noble Safeguard was established in Israel as part of a US — Israeli JTAMD force. The JTF Commander was responsible for the integration of U.S. and Israeli Patriot in a combined defense. The task force was comprised exclusively of JTAMD forces and the JTF Commander was designated as the AADC.

The world environment requires the United States not only to execute the JTAMD mission today but also to build a greater capability to defeat future threats. Successful JTAMD operations are a must to ensure protection of our forces and those of our allies. Today we are called upon to protect large civilian population centers of our allies but in the future we must be prepared to defend our homeland from the same Theater Missile (TM) type threats. The threat from TMs has not been a revolutionary development but rather it has evolved for the past 50 plus years. It will be helpful to review some history before we examine the JTAMD forces of the 21st century.

Chapter 2

Past, Present and Future

The fear of an attack on our forces and population centers from enemy missiles is not a new threat. Theater missile defense had its birth in World War II with the German missile attacks against England. The V-1 and V-2 missile attacks initially caught the Royal Air Force by surprise. Fortunately a combination of organization, early warning, point defense weapons systems (Anti Aircraft Guns), bombing of launch sites and direct attack of the incoming missiles by fighter aircraft, reduced the effectiveness of the attacks. However, it was not until the launch sites were captured by ground forces that the threat was eliminated.

The allies faced a similar threat 50 years later during the Gulf War. Although we were not surprised by the threat, we were caught relatively unprepared when Iraq launched SCUD missiles against Saudi Arabia and Israel. The United States reacted quickly to counter the threat, however our Theater Missile Defense strategy and capability to defeat the threat was essentially unchanged since World War II. Space based assets replaced airships and ground based radar found on the English coast for early warning. The quickly modified PATRIOT weapon system (not designed to engage ballistic missiles just as AA guns were designed to engage aircraft not missiles) was used as point defense for high value targets, just as AA was used to engage incoming V-1 and V-2 missiles. Once again aircraft attacked the launch sites with limited results. Special Operations Forces located the launch sites and infrastructure just as spies were employed to locate the launch sites for bombing raids in World War II. Clearly major

technological advances had been made since World War II but our basic strategy had not changed.

During the campaign against V-1 and V-2 attacks the allies flew over "31,000 sorties or 22% of the air effort between November 1943 and May 1944 to strike the original launch infrastructure".³ When comparing this with Desert Storm efforts of "1,245 sorties flown against the SCUD infrastructure" and "1,215 sorties flown as Combat Air Patrols to attack launchers",⁴ Desert Storm may appear to be a much smaller effort. However, these sorties represent a tremendous amount of combat power, committed against a relatively small missile force that yielded poor results considering today's technology. This number of sorties is too great a cost for the Joint Force Commander to expend in a single campaign particularly considering today's smaller capabilities based force. Being unprepared will force us to expend critical limited resources against the future missile threat.

Early United States JTAMD efforts can be traced to the cold war. Threats of long range missiles focused our nation's defensive measures on early warning and passive defense such as personnel protection, but the basis of the deterrent program was based on the strategic offensive of the nuclear triad to attack the Soviet Union. The first shift to an active defense and offensive operations to destroy incoming missiles began with the establishment of the Strategic Defense Initiative Organization in 1983. The SDIO concept and mission was based on President Reagan's "concerns about our ability to defend against a strategic ballistic missile attack from the Soviet Union".⁵ SDIO efforts were focused on the mainland of the United States as the theater of operations with the mission to defend against a ballistic missile attack originating from the Soviet Union.

In 1991 with the break up of the Soviet Union and the Gulf War, we began to change the way we looked at missile defense. We shifted our focus from defense of the mainland to theater level defense where our forces or would be deployed or where we may be called upon to defend allied population centers. At the time of Iraq's invasion of Kuwait our Theater Missile Defense (TMD) capabilities were lacking. The only system and measure of defense the nation had was to quickly modify and remission the Patriot Air Defense Weapon system to engage SCUD missiles. (The Patriot system was specifically designed to defeat masses of Soviet block aircraft in NATO). While the degree of Patriot's success can be argued extensively, this is not the major point. The loss of 28 soldiers killed and 160 wounded by a single SCUD missile is not a failing of a weapon system's ability to defeat a threat but rather a nation's failure to recognize and develop robust offensive and defensive capabilities and strategies to defeat the threat. We had developed tanks, ships, fighter aircraft and helicopters to defeat any cold war threat but we had not prepared our forces for the old yet new emerging threat of theater missiles.

Perhaps one of the biggest impacts of this new threat is the impact on shaping a nation's policy or decision process, to enter into an armed conflict. For example, the deployment of a NATO/PATRIOT unit and other assets to Israel was key in preventing Israel from entering the Gulf War and potentially damaging the fragile Arab coalition. The continued proliferation of WMD makes this threat too dangerous to ignore. Even though we have made strides in technology, our nations TMD capabilities rest with space based warning and ten PATRIOT battalions, a limited capability for the nation.

Today, JTAMD development and acquisition efforts within the Department of Defense (DOD) rest largely with the Ballistic Missile Defense Organization (BMDO). The DOD and

BMDO broad strategy for TMD has three major components:

- 1) Preventing and reducing the threat (counter proliferation)
- 2) Deterring the threat
- 3) Defending against the threat.⁶

This paper will focus on the third component of the DOD strategy of defending against the threat. Specifically, I will examine DOD's organization for leadership in JTAMD development as well as current and future supporting Joint Doctrine and service responsibilities. We must refine our JTAMD organization for combat development, planning and execution to maximize our future capability. This need for a JTAMD organization is an implied task of full-dimension protection outlined in Joint Vision 2010.

"The primary prerequisite for full-dimensional protection will be control of the battle space to ensure our forces can maintain freedom of action during deployment, maneuver and engagement, while providing multi-layered defenses for our forces and facilities at all levels. Full-dimensional protection will enable the effective employment of our forces while degrading opportunities for the enemy. It will be essential, in most cases, for gaining and maintaining the initiative required to execute decisive operations. The concept will be proactive and defensive actions that may extend well into areas of enemy operations. Active measures will also include an integrated, in-depth theater air and missile defense that will exploit Service-unique capabilities to detect, identify, locate, track and joint forces. Passive measures will include the inherent protection provided by information superiority and dispersal to increase our warning of attacks."⁷

As outlined above the threat from missiles is not new. We must next take a more detailed view of the 21st century air and missile threats.

Chapter 3

Threat

Theater missiles are a growing future threat because they are relatively inexpensive, easy to obtain and possess many characteristics that make them extremely demanding targets to destroy. Theater missiles can maneuver, use electronic defensive measures, be launched from mobile platforms with a small footprint and do not require a large support structure. These missiles present different technological challenges. Ballistic missiles have long ranges and travel at great speeds for relative short periods of time, thus making reaction time and engagement critical. Cruise missiles, equipped with extremely accurate guidance packages, traveling at slow speeds and low altitudes, combined with a small radar cross section, make detection a major challenge. UAVs can be launched from any direction and many types of platforms. Due to UAV construction materials and size, early warning detection will be demanding. UAVs equipped with visual sensors are a threat to the operations security of the over the horizon JTF.

It is easy to see how conventional forces are faced with major challenges in defeating the TM threat. Iraq's use of the SCUD C & B TBM was a relatively unsophisticated threat in the scope of potential missile threats. These missiles were crudely modified to extend their range, lacked a state of the art guidance system, and relied on large area targets to increase their measure of effectiveness. This low technology weapon was fired under great pressure and usually only at night. However, these types of attacks forced the allies to expend critical air power resources' in an effort to eliminate the launch sites. Due to the inaccuracy of the SCUD and the PATRIOT engagements these attacks had little to no impact on the overall military campaign. Now use the same Desert Storm model but move the clock up to 2010 and give Iraq a 1000 meter or less CEP on SCUDs, add a cruise missile threat with a 100 meter accuracy, deployed on mobile launchers

and both carrying chemical agents. The challenges that a Joint Task Force face to secure a lodgment under these conditions is greatly increased. The following chart shows how future missiles counter our conventional capabilities.⁸

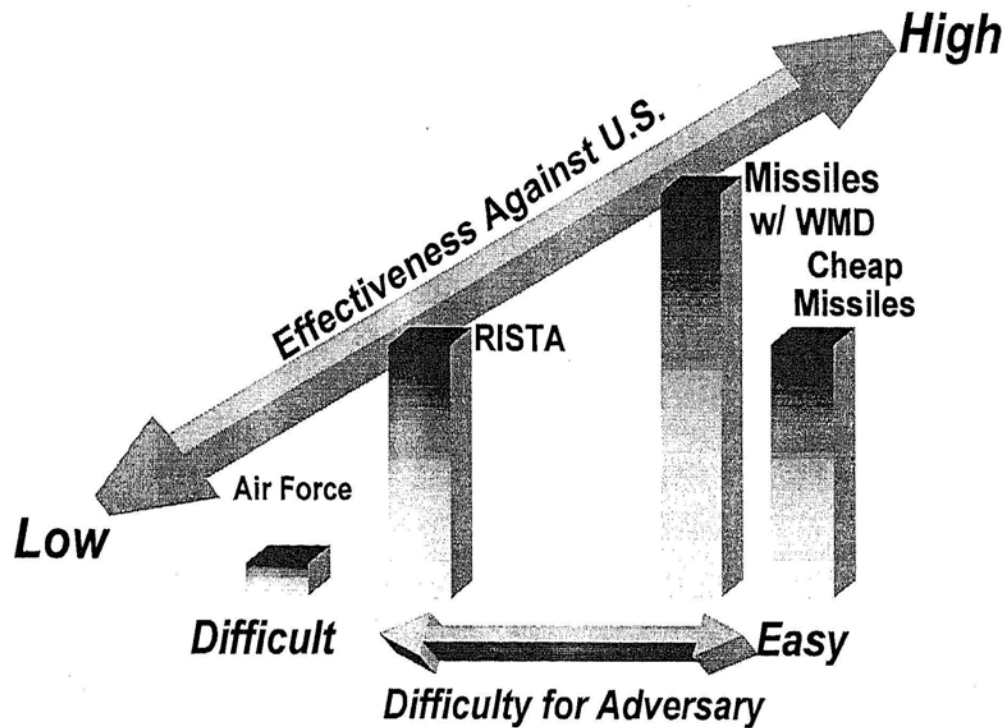


Figure 1

The asymmetrical enemy that we face in 2010 and beyond may be a small group of terrorists, large ethnic group or a third world country with an organized military force. The ease of obtaining required technology provides a wide range of options for many potential enemies. Named the "The Poor Man's Air Force", the chart on the next page highlights the advantages to shift efforts in the direction of missiles vice aircraft.⁹

The threat from theater missiles has been with us for many years and will only grow more challenging with technology improvements. The proliferation of these weapons will continue as

long as the former Common Wealth of Independent States, China and North Korea find the sale of these weapons and their technology as a profitable way to help support their economies. Today over 26 countries possess TBM's and over 100 countries have some form of cruise missiles, ballistic missiles or unmanned aerial vehicle capability.¹⁰ Perhaps the greatest challenge of all will be the potential capability for all platforms to carry small but very lethal weapons of mass destruction.¹¹

We will now look at how the Department of Defense has attacked this joint threat. I will first review DOD organization and then examine current and proposed Joint Doctrine for JTAMD.

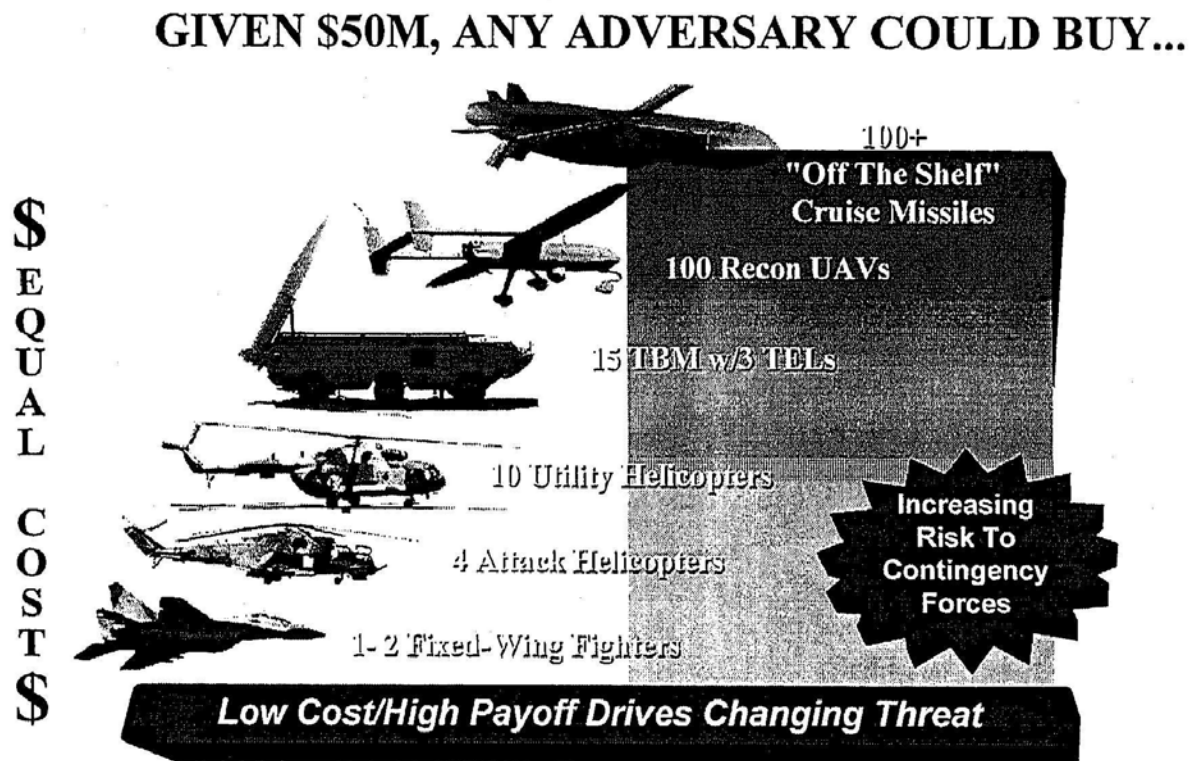


Figure 2

Chapter 4

Current Organizations

Prior to the Gulf War and the fall of the Soviet Union, each service focused primarily on the development of air defense systems or strategic missile defense systems, with very little attention on the development of TMD systems. Following the Gulf War DOD recognized the need to develop and field a robust TMD system. However, progress was hampered by traditional service rivalry over mission areas, budgets and the service's inability to speak with a common voice. DOD and Congress wanted a lead agency to put JTAMD development on a faster track. Furthermore an organization was needed to link all SDIO, service developments, technology, and lessons learned in order to develop a national missile defense capability. It was decided that the Ballistic Missile Defense Organization (BMDO) would be formed out of the standing SDIO. BMDO has been given budget authority over the services for all JTAMD acquisition. Today this organization is the key player full filling the war fighting CINC requirements.

The problem is that BMDO is an acquisition focused agency and while they should be a partner in the process they should not be the leaders in operational issues such as command, control and campaign planning. My point is not to discredit BMDO. They are doing an outstanding job in many areas, but I believe there is a better organization that will meet the warfighter's needs faster and in a more holistic fashion.

The Joint Staff has recently stood up a new organization, Joint Theater Air & Missile Defense Organization (JTAMDO). This new CJCS field operating agency (done in this fashion as not to increase the size of the joint staff, headed by a major general and staffed with approximately 40 field grade officers) has the mission to take the joint lead in theater missile defense issues. (One could argue that BMDO was filling this role so why do we need another

staff organization.) As pointed out above, the need for a non-acquisition-based organization is essential and this was the Joint Staffs answer. It should be noted that the personnel for this organization were taken out of service resources with no offset from another joint agency such as BMDO. The real question is, have we just added another layer of beauracracy or did we really add any new teeth to this critical area of building a missile defense capability for the nation.

The establishment of JTAMDO begs the question of who is the real leader in this critical area as argued by LTC Chuck Anderson and COL (RET) Richard Kurtz in their article "Air and Missile Defense - Who's in Charge". Anderson and Kurtz state that missile defense "requires a separate commander, trained staff, usable joint doctrine and a common core of active air defense command and control capabilities in service air and missile defense command centers."¹²

The above article points to the fact that we have numerous organizations involved with the development of Theater Air and Missile Defense. The nation demands a joint organization that will take the lead in JTAMD from development through employment. This organization is critical to developing the proper weapons systems, command and control, interoperability requirements, JTAMD campaign plans and annexes for the CINC to include in CONPLANS and OPLANS. This organization should be the lead for the development of doctrine, tactics, techniques and procedures for all JTAMD operations. Development of a joint war fighting headquarters would enable a single organization to be a capability provider to each CINC and help to establish national missile defense priorities. Now that we have established a need for a joint TMD headquarters we must now look at strategy, joint doctrine and service capabilities before we can refine the structure and organization of a joint organization for JTAMD.

Chapter 5

DOCTRINE

Current Joint doctrine for air and missile defense can be found in Joint Chiefs of Staff (JCS) Publication 3-01-5, Doctrine for Joint Theater Air and Missile Defense. This Publication does a good job of outlining a conceptual organization and structure on how to fight a JTAMD campaign. However, the document does not address specific requirements of battle management or the issues surrounding command and control of TMD forces for active defense.

A new Publication JCS Publication 3-01, Countering Air and Missile Threats (Draft) is currently being staffed. This new Publication if approved will replace Joint Publication 3-01.2, Joint Doctrine for Counterair Operations and Joint Publication 3-01.5, Doctrine for Joint Theater Air and Missile Defense. It will also modify Joint Publication 3-01.6, Joint Air Defense Operations (under development) into joint tactics, techniques and procedures (JTTP).

Prior to any discussion concerning doctrine, we must first look at the approved joint requirement for theater missile defense. The Mission Need Statement for Theater Missile Defense, defines a TM as a ballistic missile, cruise missile, or air to surface missile whose target is within a theater or which is capable of attacking target in a theater. The mission of TMD is "protect United States forces, US allies, and other important countries, including areas of vital interest to the US from TM attacks." The Mission Need Statement was approved by the JROCM-064-9 1 on 18 November 1991.¹³

Next we need to look at the basic principles of the approved doctrine. ***Joint Publication 3-01.5 outlines the functions and purpose of TMD as follows: (TMD) is composed of four***

operational elements: 1) passive defense, 2) active defense, 3) attack operations, 4) command, control, communications, computers, and intelligence (C4I).

The purpose of TMD is to counter the TM threat by coordinating and integrating the four operational elements of TMD into cohesive and coherent combat operations. The four operational elements are defined as follows:

Passive defense - measures taken to posture the force to reduce vulnerability and minimize the effects of a TM attack.

Active defense - operations taken to protect against a TM attack by destroying TM airborne launch platforms and/or destroying TMs in flight.

Attack operations - operations taken to destroy, disrupt, or neutralize TM launch platforms and their supporting structures and systems.

Command, control, communications, computers, and intelligence (C4I) - systems used to coordinate and integrate the joint force capabilities to conduct and link passive defense, active defense, and attack operations.¹⁴

For the past several years these four elements for TMD have been the guiding principles for current operations, planning, exercises, force structure requirements, and weapons systems development. Under the new Joint Publication 3-01, these fundamentals have been included as a subset of the overall counterair mission. The basic problem with the proposed doctrine is that by bringing TMD principles under the counterair umbrella the specific TMD focus has been diluted or lost. The "counterair opponent" would argue that the proposed doctrine fails to adequately address the force protection issues in favor of offensively oriented attack operations. The "counterair proponent" would argue that theater missiles are business as usual. They argue Joint

Publication 3-01.5 goes too far and that a theater missile is just another target set in an air war. Further they would argue that the current structure does not need to be changed but is more than adequate to accomplish the mission.

A close examination of the evolving threat across the spectrum of conflict as outlined in JV 2010 shows that we will not face a enemy fixed wing threat, but most likely a missile or UAV threat. While we should be addressing all threats we must build the necessary doctrine to handle the most likely and most dangerous threat.

Evolving Doctrine - Joint Publication 3-01 Key Points

The major shift from previous publications is that Joint Publication 3-01 expands the definition of counterair to integrate service components in both offensive and defensive operations. The new definition is " Joint counterair operations are executed by all components, using a variety of integrated weapons systems and sensors to counter threats both before and after launch. The counterair mission may employ aircraft, surface to air missiles, artillery, special operations forces, or information operations against a variety of threats. Those threats include enemy aircraft (manned or unmanned), ballistic missiles and cruise missiles (air and sea launched)."¹⁵

Joint counterair operations are further broken down into offensive and defensive operations. Offensive counterair (OCA) is generally those means used to attack infrastructure. The goal of OCA is to prevent the launch of enemy air and missile threats. This is the same basic principal of attack operations from Joint Publication 3-01.5. Defensive counterair (DCA) are those measures designed to detect, identify, intercept, or negate enemy air and missile forces attempting to penetrate the friendly air environment.¹⁶

Joint Publication 3-01 defines the mission of DCA as "operations, in concert with offensive operations to provide a secure area from which joint forces can operate". (DCA described in Joint Publication 3-01 can be equated to the active and passive defense definition in Joint Publication 3-01.5.) DCA operations include both the active and passive air defenses. Passive air defenses are those measures units and individuals take to reduce the impact of an air or missile attack. Passive defense includes early warning, concealment, NBC protection, cover, deception, and dispersal of personnel and equipment. The other half of DCA, active defense is "direct action" taken to destroy or reduce the effectiveness of hostile air and missile attacks. These measures normally include weapons systems that defend enemy point or area targets or friendly critical assets. Active Defense includes the planning of weapon systems employment and ROE as well as early warning. Active defense is normally directed by the AADC.

A key point of Joint Publication 3-01 is the requirement for theater level plans to be integrated with strategic plans for the defense of the United States. This is linked directly back to the JROC approved Mission Need Statement. The integration of theater plans into national plans is a tremendous undertaking and cannot be done by an organization that is not functioning today. The publication states the mission must be done but leaves us all guessing on whom. I believe the answer is a dual lead of BMDO and a lead joint headquarters. So the question that needs to be answered is who will do this war fighting mission of national missile defense. It will be too late to stand up an organization after a cruise missile is launched off the coast of the United States or a TBM launched from Central America by a terrorist group. There are several candidates for this mission such as USSPACECOM or STRATCOM or as a new organization under USACOM. BMDO could not be selected, as they are not structured to be a war fighting

CINC. Presently the Capstone Requirement Document for JTAMD is being developed by USACOM and the Capstone Requirement Document for National Ballistic Missile Defense is being developed by USSPACECOM. So again we have split the integration effort desired by the mission need statement between two organizations.

While both Joint Publications 3-01 and 3-01.5 discuss typical command and control relationships they fail to address the real challenge of battle management. Counterair operations have historically relied upon two types of control, procedural control or positive control. Positive control is based upon sensor data, communications or identification means such as IFF. Procedural control is specified by orders or procedures defined in approved operations orders prior to hostilities and are designed to prevent the interruption of combat operations due to a loss of positive control or during periods of heavy engagement. But neither document takes issue with how to handle the 2010 threat in terms of battle management. Questions that need to be answered are:

- 1) What changes will have to be made to accommodate threat UAVs and CMs in the Joint Engagement Zone?
- 2) What is the impact of new positive identification procedures or capabilities with new technologies of 2010, will the need for procedural control be eliminated in a US only environment?
- 3) Can operations covering two or more geographic CINC AOR's now be conducted?
- 4) Do we really need two controlling authorities given future technology or can one headquarters support two CINC simultaneously?

Normally component capabilities are placed under the tactical control (TACON) or in

Direct Support (DS) of the Joint Force Air Component Commander (YFACC) or Area Air Defense Commander (AADC). Normally command is retained by the service component such as a numbered air force, fleet carrier wing, or air defense brigade.

Control of counterair operations, particularly active defense, is best suited for centralized planning and decentralized execution due to the timeliness of the situation. Incoming missiles are always hostile and have very short engagement window. A ballistic missile may have an extremely short flight time from launch to impact depending upon distance to the target, type of missile, friendly ability to detect, and passive warning. Engagement decisions must be made in split seconds or immediately upon detection. A third reason for immediate engagement is to maximize deep strike assets. A decision based upon intelligence data received that a missile or UAV is being loaded with a WMD capability will require the destruction of its launch site immediately. In both examples clear procedures and an established ROE, free from a complicated control chain, is critical for effective counterair operations.

Key Leadership Positions

There are three key leadership positions for counterair operations, the Joint Force Air Component Commander (JFACC), Area Air Defense Commander (AADC), and the Airspace Control Authority (ACA). Close coordination is required among all players. Before we can examine how each player interfaces with each other we must first understand the basic functions of the respective positions.

The Joint Force Air Component Commander (JFACC)

The Joint Force Commander (JFC) will designate the JFACC for the Joint Operations Area (JOA) based upon the component commander that has the preponderance of air assets and

the best capability to conduct a joint air campaign. The JFC will also give initial guidance for the JTMD campaign.

Joint force commander level guidance may include (but is not limited to):

- A methodology for joint planning of Joint Theater Missile Defense (JTMD). Priority of the JTMD effort; for example, what types of targets, most important for attack operations, and what friendly assets must be protected by active defense
- Definition of the areas of operations of components
- Apportionment of forces
- The capabilities or forces made available to the functional components
- Guidance on component-to-component coordination to facilitate deconfliction and timely Theater Missile Defense operations
- The role of the joint force commander's staff in coordinating JTMD activities
- Degree of joint targeting coordination board involvement in JTMD¹⁷

The **JFACC** derives authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The joint force commander will normally designate a joint force air component commander. The joint force air component commander's responsibilities will be assigned by the joint force commander (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision). Using the joint force commander's guidance and authority, and in coordination with other Service component commanders and other assigned or supporting commanders, the joint force air component commander will recommend to the joint force commander apportionment of air sorties to various missions or geographic areas.¹⁸

The JFACC develops the air operation plan to support the JFC objectives that includes the following;

- Recommending to the JFC apportionment of the joint air effort, after consulting with other component commanders
- Providing centralized direction for the allocation and tasking of capabilities/forces made available
- Controlling execution of joint operations as specified by the JFC

- Coordinating joint air operations with operations of other component commanders and forces assigned to or supporting the JFC
- Evaluating the results of joint air operations
- When assigned by the JFC, performing the duties of the airspace control authority (ACA) and/or performing the duties of the area air defense commander (AADC)
- Functioning as a supported and supporting commander, as directed by the JFC.¹⁹

Area Air Defense Commander (AADC)

The next key position is AADC. Designated by the JFC the AADC is responsible for “implementing theater /JOA wide defense priorities through promulgation of a Joint Air Defense Plan and is normally the component commander with the preponderance of air defense capability to conduct integrated air defense operations. Further the AADC establishes weapons control procedures and measures for all DCA weapons systems and forces.”²⁰

The AADC within a unified command, subordinate unified command, or joint task force, the commander will assign overall responsibility for air defense to a single commander. Normally, this will be the component commander with the preponderance of air defense capability and the command, control, and communications capability to plan and execute integrated air defense operations. Representation from the other components involved will be provided, as appropriate, to the area air defense commander's headquarters.²¹

Airspace Control Authority (ACA)

The JFC also designates the Airspace Control Authority (ACA) who is responsible for operating the air space control system by developing an Air Space Control Plan and Air Space Control Order (ACP and ACO). The ACA does not receive forces either TACON or DS or assigned. The JFACC will many times perform the role of the ACA to ensure close coordination and interoperability can be achieved during combat operations. The ACA is the commander

designated to assume overall responsibility for the operation of the airspace control system in the airspace control area.²²

- Coordinate and integrate the use of the airspace control area.
- Develop broad policies and procedures for airspace control and for the coordination required among units within the area of responsibility / joint operations area.
- Establish an airspace control system that is responsive to the needs of the joint force commander, provides for integration of the airspace control system with that of the host nation, and coordinates and deconflicts user requirements.
- Develop the airspace control plan and, after joint force commander approval, promulgate it throughout the area of responsibility/joint operations area.
- Provide the flexibility needed within the airspace control system to meet contingency situations that necessitate rapid employment of forces.
- Centralized direction by the airspace control authority does not imply assumption of operational control or tactical control over any air assets.²³

Now that we have looked at the doctrinal foundation, we should turn our focus to the different service views. We should also examine some future concepts that will allow us to apply current doctrine in a different framework.

Chapter 6

Doctrinal Battle

As of this writing the approval of Joint Publication 3-01 is being staffed with the services. It should come as no surprise the services cannot agree on the document. The Army and Navy see the Publication as Air Force Doctrine under a joint cover sheet. The basic argument is geographical separation of battle space. The USAF has taken a theater view and the Army/Navy have a component view. It is anticipated that the CJCS will arbitrate the service differences over this publication. Additionally, for the past several years current concepts and functions outlined in the current Joint Publication 3-01.5 have been exercised and embedded in the Army and Navy doctrine as well as weapon system development.

The Army and Navy believe the new counterair doctrine standardizes or makes things so rigid that the JFACC will always be Air Force. This goes back to the long standing argument of whether missiles are a subset of the counterair fight, just another target set, or are they so important they demand special attention in doctrine and organization. I firmly believe that when one studies the threat in JV 2010, one cannot draw any other conclusion than missiles and UAVs must be addressed as a separate and distinct threat demanding detailed doctrine with agreed upon command and control procedures. If JTAMD is too wrapped up into the counterair doctrine then the clarity found in Joint Publication 3-01.5 would be lost.

The future air threat across the spectrum of conflict support specific doctrine for JTMD. A detailed examination of the likely threat we will face in 2010 and beyond shows that very few if any potential enemies will possess a fixed or rotary wing air force of any size. The majority of our potential enemies will rely upon unmanned aircraft or missiles. The future joint counterair

campaign in these situations will be predominately a DCA campaign, within the guidelines of Joint Publication 3-01 or a JTAMD campaign under Joint Publication 3-01.5. It is extremely important to maximize our DCA assets when we look at how we may respond given multiple threats and limited resources. We may decide to harbor our fixed wing assets to be prepared to face a larger or more significant threat from another MTW. The JTAMD fight may become a strategic economy of force effort in one theater while we observe other regional developments.

Here are a few plausible scenarios:

- 1) An internal faction that has recently procured a small number of cruise missiles and UAVs is threatening country X. Country X has strategic mineral reserves, with friendly trade relations that make them of interest to the United States. The potential type of warheads the threat has is unknown. The US long standing engagement policy has obligated us to support this regional friend. However, we do not want to risk American lives or deploy a major force to the region. The JCS has recommended deployment of a defensive system for protection of the capital and a major seaport of the country. Additionally, we will deploy special operations forces to help locate and destroy the launch sites and platforms. This is a case where we need the capabilities for passive defense and active defense and do not require a JFACC afloat or on shore. For example an Aegis cruiser may be all we need to provide for the protection and integration of all other JTAMD activities.
- 2) Country Y is threatened by its neighbor that just acquired a TBM capability. Earlier this year Country Y declared their new F-15/16 Air Wing fully operational. However they lacked any TBM protection for their major city and seaport. The United States

decides to deploy a ground base defensive system and a Marine Expeditionary Unit to lead local forces in the search for the launch sites. Once the launch sites are detected they will be destroyed using Country Y's new air power. In this case there is no need for a JFACC or US air power to achieve the objectives. However the need for a command element, or an AADC does exist.

In both cases it may be more desirable to deploy US air power but we may not because of tensions elsewhere in the world, or lacking of popular or political support. Additionally we have experienced the inability to obtain basing rights making the use of air power difficult requiring the use of sea based assets. Further the employment of defensive capabilities may be more politically acceptable to the world community.

Common to both these cases is the need for a capability to conduct a detailed IPB, develop an appropriate plan and execute a JTAMD operation as a stand-alone mission. The review of doctrine thus far, clearly outlines the AADC as responsible for this mission. However, Joint Publication 3-01 calls for the JFACC to normally be assigned as the AADC. More than likely the JFACC would have to be stood up and resourced before any planning could take place. What if we did not want to resource a JFACC at that particular time? It would be more effective, and in accordance with doctrine, if there was an operational headquarters that could provide the above capability both in crisis and deliberate planning situations. In the next section we should look deeper into the functions of the AADC.

Chapter 7

BASIC FUNCTIONS

We should compare basic functions of the JFACC and AADC as prescribed by Joint Publication 3-01, 3-01.5, 3-52 and 3-56.1 to help establish basic AADC requirements.

	AADC	JFACC
PLANNING	<ol style="list-style-type: none"> 1. Produce an Active Defense Plan 2. Assign Missions 3. Develop Control Procedures 4. Develop Linkages to OCA or Attack Operations 5. Integrate TMD and Theater Air Defense Active Defense Plans 6. Recommend Rules of Engagement 7. Plans JTMD Active Defense Operations- friendly Capabilities 8. Disseminates Early Warning to all Components and HN Authorities 9. Plans for Cue Information to Shooters 	<ol style="list-style-type: none"> 1. Develop Air Campaign 2. Develop target list 3. Assign missions 4. Apportion Air Assets 5. Develop Initial Air Tasking Order
COORDINATING & EXECUTING	<ol style="list-style-type: none"> 1. Change Missions/Priorities 2. Coordinate Theater Air Defense and TMD Engagements 3. See, understand, and control the JTAMD Battle 	<ol style="list-style-type: none"> 1. Change Mission/Priorities 2. Coordinate OCA/DCA 3. Deconflict Airspace 4. Respond to Request for CAS 5. See and understand the deep battle

Comparing the data in the above chart and reviewing proposed and approved doctrine points out certain principles that are common to all players in an integrated air defense operation. These principals are;

- Common BMC4I Structure
- Common shared understandable air picture
- Common, doctrine tactics, techniques and procedures
- Centralized Planning and decentralized execution²⁵

No matter which set of doctrine manuals is finally agreed upon, it is clear that there is a common set of requirements for the AADC. The greatest injustice would be for these requirements to be lost or diluted into another set of forgotten JTTPs. The functions of the AADC must remain as doctrine to be effective.

Knowing the basic functions of the AADC, we can now look at specific capabilities that the AADC must possess in order to perform those functions. The AADC must have a planning and execution capability that will operate in and support joint operations. It must be a fully interoperable system that can be used with all service structures. (This assumes that other aspects of joint operations are being developed as well such as joint data links and communications systems.) The functions that follow are core requirements that must be accomplished to ensure success in the JTMD war fight.

- 1) Receive and evaluate Intelligence Preparation of the Battlefield (IPB) — this includes the ability to receive intelligence information from multiple sources simultaneously.
- 2) Air Defense Plan Development
 - Receive JFC Guidance

- Determine the critical or defended assets requirements
- Integrate all friendly capabilities
- Plan for logistic support requirements for sustaining combat operations
- Maximize campaign effectiveness by war gaming friendly JTAMD COAs vs enemy most likely and most dangerous COAs and develop branches and sequels for selected COA or operational plan

3) Provide JTAMD input to JFACC target list

4) Coalition Forces and Host Nation Coordination

- Coordinate with service components, coalition forces and Host Nation Authorities for passive defense, early warning and integration of forces if available

5) Situational Awareness

- Monitor and assess changes in enemy and friendly capabilities, tactical through strategic levels
- Assess results of attacks on infrastructure and engagements of incoming missiles, destroyed by active defense forces, on the enemy capabilities. Modify friendly operations in accordance with success or failures to date

6) Air Defense Operations

- Control of AD Weapons Control Measures and Air Defense Warning System

Using these core requirements as a baseline we can see how each one applies to recent JTAMD exercises, studies and actual operations. We will examine the lessons learned in the next section as a means to validate these basic requirements.

Chapter 8

Applying Lessons Learned

The lessons learned in Desert Storm have resulted in many changes to JTAMD. Publication of Joint Publication 3-01.5 is just one of many examples. Additionally doctrinal changes have been applied in several major exercises and simulations such as Ulchi Focus Lens (Korea), Roving Sands (El Paso, TX/White Sands Missile Range, NM), USACOM War Game Coherent Defense, the Optic Series of EUCOM exercises to name a few. These events have produced new lessons and uncovered some new challenges. Some of the lessons are summarized below.

- LL # 1 - Each component commander requires a TMD element. All component commanders have some element of their forces engaged in the JTAMD fight. The TMD threat impacts all forces from combat to combat support to civilian population centers and across all service lines.
- LL #2 - Conducting JTAMD requires numerous LNOs under current organization. The requirement to exchange information between the service components to execute their respective piece of the JTAMD campaign demands LNOs be located at deployed headquarters. The current C4I system does not provide for timely shared information therefore many commands that require key TMD data or must input to the JTAMD reporting or planning process are forced to use LNOs to pass or receive critical information.
- LL # 3 - "There is a science to killing TBMs...it is not a reactive fight". Simply put, the technology required to defeat a single TBM attack or execute a successful campaign is not simple, it requires multiservice assets. Asset protection, weapon

system employment and positioning, selection of primary target lines, passing of warning and cueing information all require an in depth knowledge of threat characteristics and friendly capabilities. A detailed IPB is critical to JTAMD success.

- LL # 4 - TMD is not business as usual.... it is a focused effort. As outlined in Joint Publication 3-01.5 there are many moving parts to planning and executing the JTAMD campaign? Coordination and integration is required across the spectrum from special operations forces coordination with deep strike attack assets (air, artillery or naval assets) to integration of shared early warning to host nation.²⁶

JTAMD requires the ability to have a seamless Battle Management and Command and Control System handling all joint integration requirements. For example in a scenario that starts out with a JFACC afloat and involves a subsequent transfer to an Air Force JFACC is a complex problem. The airspace control data base must be downloaded to the new command's system or how will the transfer of authority be conducted during combat operations is a significant challenge. I was unable to uncover any exercise that has demonstrated this transfer. The Navy plans to test this concept just short of an actual transfer to land based JFACC in 1998. In Desert Storm we started with a JFACC and AADC on the ground and it remained that way through out the operation.

Examination of future operations in 2010 it is possible to begin a campaign with a Navy TMD and air capability; transfer to a Marine Corps Air Ground Task Force supported with Army TMD assets operating out of a secure lodgment. This operation may be disaster relief or peace enforcement with a TM threat from a neighboring country not directly involved with the operation but whose actions are unpredictable. This situation would not require a robust JFACC

organization but rather a capable AADC that could expand or transfer into a JFACC if required.

To further show the confusion in joint theater air defense doctrine, we should look at Desert Storm experience once again. Command and control was not seamless between the services during Desert Storm. While joint doctrine gave the AADC planning capability, it gave little authority for execution of an integrated theater defense operation. The result was a disjointed theater system. The Navy was allowed to conduct air defense up to the land — sea boundary. Army Patriot units were given extremely restrictive engagement zones for incoming TBMs. The Air Force utilized standard Fighter Engagement Zones (FEZ) under control of the Air Component Commander. Clearly joint air defense was not conducted in this case, nor has it been since, we still "carve up" battlespace. The impact of this type of an arrangement was that weapons systems were not employed to their maximum capability.²⁷

During UFL 97 it was revealed that the JFACC, who remained dual hatted as the AADC, lost the ability to conduct the JTMD campaign. The JFACC became so involved with the other aspects of the counterair fight particularly the intensity of the OCA fight, that JTMD issues were not handled efficiently or in a timely manner.²⁸ I know from personal experience that in a previous UFL, the same was true. In UFL 1995 the JFACC who was serving as the AADC failed to alert TMD forces resulting in effective surprise red force TBM launches. As a result the blue force capability to generate sorties was severely degraded and the blue ground forces ability to defend was challenged in the early phases of the exercise. During our recent visit to 7th AF it is apparent that they are just now coming to grips with how to fight the JTMD piece of the counterair campaign. TMD is truly a joint fight and requires a joint solution. In the next section we will look a possible solution for leadership of JTMD.

Chapter 9

Recommended Solution

The best approach to this challenge is the formation of a joint operational headquarters responsible for theater air and missile defense. This organization should be designed, structured and equipped as a deployable JTF command and control headquarters. The command would receive its forces from service components just as any other unified command does today. This organization's major role is the area air defense commander when deployed in support of the regional CINC. Structured and resourced correctly this organization will be capable of supporting two MTWs simultaneously.

This concept is not new. From 1957 to 1995 (the unit was no longer required when the Soviet threat disappeared) the Army's 32d Army Air Defense Command (AADCOM) served in Europe and provided all theater level planning and air defense for active defense (primarily SAM systems) to NATO forces in the Central Region. The 32d AADCOM provided forces on a daily basis to support the NATO readiness mission. The 4th Allied Tactical Air Force was the controlling authority and the US Army retained command. The same was true of US Air Force fighter air defense forces. The point is that we have successfully operated with an area air defense structure previously.

Another example can be found in naval doctrine of the composite warfare commander. The concept appoints a force anti-air warfare commander (FAAWC) who is responsible for defending the battle group. Under this concept the FAAWC is given tactical control of necessary ships and aircraft to conduct air and missile defense operations for the CVBG. This concept could be expanded to include JTAMD forces ashore as well. For example, given future

technology developments by 2010 a FAAWC conceptually could be responsible for JTAMD of Japan and Korea simultaneously.

Presently the Army and the Navy are experimenting with new types of structures and technologies to perform the mission of air and missile defense. In October 1997 the Army activated the Army Air and Missile Defense Command (AAMDC) at Ft Bliss, TX. This organization is relatively small in size and commands no forces on a daily basis, The AAMDC mission is to deploy to a theater and perform air and missile defense planning, coordination, integration, and execution in support of CINC priorities. The AAMDC will establish an integrated land, air, sea picture and share that picture with all forces so that the IPB can continuously be updated and friendly capabilities can be adjusted. Currently the AAMDC is deployed to Kuwait in support of the recent operations. Additionally, the AAMDC will command the theater army air and missile defense forces assigned.²⁹

Currently the Navy is developing an AADC capability that contains a seamless BMC4I architecture and flexible command structure. The concept includes the use of all emerging technologies such as over the horizon targeting and engagement capabilities.³⁰ The prototype AADC has been developed and tested at John Hopkins Labs this year. The capability was based on board the USS Port Royal (CG73) during a JFTEX 97-2. This proof of principal exercise demonstrated that an AADC in an Aegis cruiser is desirable and can be done with augmentation in personal and C4I. (Army personnel did participate) The next step for the Navy is to deploy this baseline capability with a carrier battle group deployment in FY 98.³¹ During this deployment the navy will test the ability to transfer the JFACC afloat to a notional JFACC/AADC ashore in an effort to establish baseline conditions and requirements for these

types of operations.

During my research I also visited the Air Staff. Other than comments from joint exercises the staff officers were very reluctant to discuss future concepts or possibilities to future role changes in the JFACC or AADC. The opinion expressed by the individuals I spoke with was that there are no problems with the current systems or doctrine. The JFACC is perfectly capable of handling the AADC mission and the current C4I systems will be upgraded through the normal product improvement process to operate in a joint environment. The staff officer I visited placed a condition on our discussions that I could not use anything in my paper that we discussed other than approved Air Force doctrine. This was quite different from the Navy and Army who discussed current issues and ongoing turf battles and gave their honest and frank opinion. In my opinion the Navy and Army are trying to find a joint solution to the JTAMD and counterair challenges, yet the Air Force does not wish to change.

My proposal for an AADC JTF headquarters would utilize existing doctrine, control systems and couple them with the Army and Navy efforts. We should maximize on all service capabilities and place them under a single joint commander. This joint organization should become the nation's user of JTAMD systems. This new organization would speak as a user or the lead CINC representative to BMDO to insure resources are focused to develop joint air and missile defense capability. I am aware that this is in BMDO's charter to ensure interoperability and some may argue that in this area what I am proposing is redundant. In fact to BMDO's credit they are taking the lead in many key areas and have done an outstanding job particularly in the CINC exercise program.

This joint AADC command would provide for doctrinal planning, and coordination

functions previously outlined. It would be a full time planning headquarters for all CINCs and would be the tie to national missile defense. This organization would lead the joint air and missile defense exercise and training programs and be the executive agent for the development or changes to joint doctrine. The basic functions of the AADC are outlined below. The functions are derived from Joint Publication 3-01.5 and 3-01 (Draft).

1. Conduct threat level planning, coordination, integration and execution JTMD functions for each JFC.
2. Keeper of and applies lessons learned uniformly across the services and takes the lead in C4I system development.
3. Assist the component commanders in training and evaluating JTAMD systems and units during exercises. Help train component staffs during exercise train up periods.
4. Provide systems to enhance coordination.
5. Be the planning link between theater level and national missile defense.
6. Serve as the joint user of JTAMD products and systems for service acquisition agencies.
7. Man, equip and train a deployable headquarters that deploys to support CINCs and perform air and missile defense planning, coordination, integration and executes the joint air and missile defense plan in support of the war fighting CINCs.

This headquarters would be our key to building a joint success story on the 21st century.

Chapter 10

Conclusion

The formation of an organization that is the nations JTAMD JTF Headquarters is a means of full filling part of the national military strategy that requires a joint force capable of providing full dimension, multi-layer force protection. This headquarters will have the ability to look deep, advise the CINCs and develop the war plans that will prevent our relearning hard lessons about the TMD threat.

In this paper I have argued that the requirement for a permanently structured and resourced organization to fulfill theater air and missile defense as well as national missile defense doctrine, material development, and operational requirements is key to fulfilling Joint Vision 2010. Such an organization would serve to ensure interoperability, tailor force packages for deployment, conduct JTAMD defense design in support of OPLANs, and maximize use of the future joint battle space.

This AADC headquarters would provide for the single joint warfighter lead that is missing today. This standing organization operating on a daily basis is our path to success in winning the future war against theater missile threats and provides the foundation to protect our homeland in the future.

¹ Chairman of Joint Chiefs of Staff, National Military Strategy (Washington DC. Chairman of Joint Chiefs of Staff, 1997), 26.

² Joint Chiefs of Staff Concept for Future Joint Operations, Expanding Joint Vision 2010 (Washington DC. Joint Chiefs of Staff, J-7, May 1997), 9-13.

³ MAJ Vincent P. D. Fronzo, USAF, "Unity of Command - Countering Aircraft and Missile Threats," Joint Forces Quarterly, Spring 1996, 30.

⁴ Fronzo, 31.

⁵ LTG Malcom O'Niell, "The US Vision for Theater Missile Defense", A Collection of Papers Presented at Eight Multinational Conference on TMD, June 1995.

⁶ Paul G. Kaminski, USD, A & T, "DOD's BMD Programs", Defense Issues. Volume 12, Number 14, March 6, 1997.

⁷ Chairman of Joint Chiefs of Staff, Joint Vision 2010 (Washington DC. Chairman of Joint Chiefs of Staff, 1997), 22-23.

⁸ United States Army Air Defense Artillery School, FY98 Air and Missile Defense Master Plan (Fort Bliss, Texas 1 October 1997), 2-1.

⁹ United States Army Air Defense Artillery School, FY98 Air and Missile Defense Master Plan (Fort Bliss, Texas 1 October 1997), 2-3.

¹⁰ United States Army Space and Strategic Defense Command (USSADC) PAMI0-1, 7.

¹¹ United States Army Space and Strategic Defense Command (USSADC) PAMI0-1, 8.

¹² LTC Charles Anderson and COL (RET) Richard Kurtz, "Who's in Charge?", Air Defense Artillery Magazine, July -August 1996, 7.

¹³ Joint Chiefs of Staff, J-36, Joint Theater Missile Defense CONOPS, (Washington D.C.)17 Feb 95, 2.

¹⁴ Joint Publication 3-01.5, Doctrine for Joint Theater Missile Defense. (Washington D.C.: Chairman of Joint Chiefs of Staff, 22 February 1996), viii.

¹⁵ Joint Publication 3-0 1, Joint Doctrine for Countering Air and Missile Threats, Draft, (Washington D.C.: Chairman of Joint Chiefs of Staff, July 1997), v.

¹⁶ Joint Publication 3-0 1, Joint Doctrine for Countering Air and Missile Threats, Draft, (Washington D.C.: Chairman of Joint Chiefs of Staff, July 1997), vi.

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- ¹⁷ Joint Publication 3-01.5, Doctrine for Joint Theater Missile Defense, (Washington D.C.: Chairman of Joint Chiefs of Staff, 22 February 1996), 11-3.
- ¹⁸ Joint Publication 1-02, DOD Dictionary of Military and Associated Terms, (Washington D.C.: Chairman of Joint Chiefs of Staff, 23 March 1994, Updated April 1997), 286.
- ¹⁹ Joint Publication 3-56.1, Command and Control for Joint Air Operations, (Washington D.C.: Chairman of Joint Chiefs of Staff, 14 Nov 94) 11-3.
- ²⁰ Joint Publication 3-01, Joint Doctrine for Countering Air and Missile Threats. Draft, (Washington D.C.: Chairman of Joint Chiefs of Staff, July 1997), VII.
- ²¹ Joint Publication 1-02, DOD Dictionary of Military and Associated Terms, (Washington D.C.: Chairman of Joint Chiefs of Staff, 23 March 1994, Updated April 1997).
- ²² Joint Publication 1-02, DOD Dictionary of Military and Associated Terms, (Washington D.C.: Chairman of Joint Chiefs of Staff, 23 March 1994, Updated April 1997).
- ²³ Joint Publication 3-52, Doctrine for Joint Airspace Control in the Combat Zone, (Washington D.C.: Chairman of Joint Chiefs of Staff, 22 July 1995), 11-3.
- ²⁴ LTC Charles Anderson and COL (RET) Richard Kurtz, "Who's in Charge?", Air Defense Artillery Magazine, July -August 1996, 7, (Modified from the original version Air Defense Artillery Magazine).
- ²² Dennis Cavin, BG, USA, "Army Air and Missile Defense Command Briefing" Presented to CG, EUSA and CG 7th AF during UFL 97, Korea.
- ²⁵ Headquarters Department of the Navy, Surface Warfare & Air Warfare Divisions, "Joint Integrated Theater Air and Missile Defense White Paper", (Washington D.C. July, 25, 1997).
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³¹ Commander USS Port Royal Message to CNO Washington D.C., subject; "AADC in USS Port Royal (CG 73) during JTFEX 97-2 Lessons Learned," 0705Z28 July 1997.

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