NAVAL WAR COLLEGE
Newport, R.I.

IMPROVING THEATER BALLISTIC MISSILE DEFENSE AT THE OPERATIONAL LEVEL OF WAR

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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20 May 1996

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REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED	
2. Security Classification Authority: N/A	
3. Declassification/Downgrading Schedule: N/A	
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.	
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT	
6. Office Symbol: C	**7. Address:** NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207
8. Title (Include Security Classification): IMPROVING THEATER BALLISTIC MISSILE DEFENSE AT THE OPERATIONAL LEVEL OF WAR (UNCLASSIFIED)	
9. Personal Authors: CDR STEVEN C. SCHLIENTZ, USN	
10. Type of Report: FINAL	**11. Date of Report:** 20 MAY 1996
12. Page Count: 28	
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.	
14. Ten key words that relate to your paper: THEATER BALLISTIC MISSILE DEFENSE, PATRIOT, THAAD, ACTIVE DEFENSE, PASSIVE DEFENSE, ATTACK OPERATIONS, C4I, JTMD, THEATER BALLISTIC MISSILE, OPERATIONAL PROTECTION	

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16. Distribution / Availability of Abstract:	**Unclassified** X	**Same As Rpt**	**DTIC Users**
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841-[redacted] 6461		**20. Office Symbol:** C	

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AT THE OPERATIONAL LEVEL OF WAR

The proliferation of theater ballistic missiles (TBMs) and weapons of mass destruction (WMD) throughout developing nations is so widespread that over 20 states may have an operational capability to deliver WMD using TBMs by the turn of the century. As amply demonstrated during the Gulf War, even cheap, unsophisticated, and militarily insignificant TBMs such as the Al Hussein (modified Scud-B) can pose a psychological impact so severe that a strategic center of gravity such as the cohesion of alliances and coalitions may be threatened. The enormity of this threat will rapidly exacerbate with improvements in the accuracy, range and lethality of TBMs.

In recognition of this emerging threat, Congress has drastically increased funding for the development of various robust systems for joint theater missile defense (JTMD). However, the first active defense systems and supporting space-based sensors that will provide a true *area* protection will be fielded no earlier than 2004.

Joint Force Commanders (JFCs) cannot rely *solely on Patriot* to provide the desired level of operational protection. To defend against this escalating threat in the near-term, the JFC must integrate and coordinate a mix of mutually supporting measures. These measures constitute the elements of JTMD: active defense, passive defense, attack operations, and supporting command, control, communications, computers, and intelligence. Each of these elements will be examined to reveal critical areas where the JFC can direct operational changes and provide guidance that will improve theater protection using *resources that are available today.*

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INTRODUCTION

> Perhaps the most serious and proximate military threat to the western democracies is ballistic missile proliferation combined with the spread of NBC technology for warheads. Political measures are in hand but they cannot be wholly effective. The importance of military protection in the form of theater missile defense should therefore be self evident.[1]

Throughout Desert Storm, people, all over the world, sat mesmerized in their living rooms watching the Iraqi Scud attacks on television. One could not avoid the stark realization that the capability to possess and employ theater ballistic missiles (TBMs) was no longer the sole domain of the superpowers. Not only is the list of Third World countries with TBMs rapidly expanding, but many of these countries are developing huge chemical and biological stockpiles that can be employed by these missiles. By the turn of the century, few places on the earth will be free from the threat of chemical attack.[2]

Qualitative improvements in navigation and guidance systems can easily be back-fitted into even the most primitive TBMs. This technology is available to developing nations commercially, and is relatively inexpensive. For example, a Scud guidance section containing a Global Positioning System (GPS) receiver or the slightly less precise Russian Glonass satellite navigation receiver, or a combination of the two, will achieve a dramatic increase in accuracy.[3] In future conflicts, fewer, more accurate missiles will achieve the desired level of destruction; and larger targets, especially airfields, ports, force concentrations, logistic facilities, and major population centers will be even more lucrative targets for TBM attack.

Besides precision accuracy, modern technology offers the TBM user significant enhancements in targeting techniques, propulsion systems, and conventional warhead design

that collectively contribute to increased lethality. High-resolution photo imagery from systems such as LANDSAT, SPOT, and EOSAT is readily obtainable on the commercial market enabling certain third world countries to detect significant large scale military activity with targeting information sufficient for TBM attack.[4] Upgraded propulsion systems extend the range and increase the speed of TBMs, while recently available cluster munition warheads extend the destructive radius of a single weapon. These advances further frustrate and complicate joint theater missile defense (JTMD) efforts. Undoubtedly, the coalition forces in the Gulf War would have suffered more grievous losses with accompanying political ramifications if Iraq had possessed longer range missiles, used chemical or cluster warheads, or had incorporated more accurate Scud guidance systems.

Improved intelligence and employment methods would have enabled Iraq to exploit more of the coalition's vulnerabilities. Iraq could have targeted the many areas that were completely outside of Patriot point defense coverage (which included Turkey, less Incirlik, and many areas in Israel), or could have launched Scuds in barrages that would have saturated the widely spread Patriot defenses, instead of firing one to three at a time.[5]

Therefore, evolving technology has made the TBM even a greater threat for the next war, so momentous that it has forced a change in the priorities of U.S. defenses against ballistic missiles. As a result of the declining strategic nuclear threat and the recognition of the rapid escalation of regional TBM threats, the highest priority of our nation's ballistic missile defense efforts has shifted to theater missile defense, with second priority going to national missile defense. This major reversal was principally driven by the "urgent requirement to protect friends and allies in coalition operations from threatening actions or

blackmail by a rouge state."[6] The former Strategic Defense Initiative Organization was reorganized and renamed the Ballistic Missile Defense Organization (BMDO) as a result of the shift in emphasis from global to theater threats.

Joint force commanders (JFCs) must provide highly effective force protection for U.S. expeditionary forces, allies, coalition members, and civilians yet their sole active defense system--the Patriot--is insufficient to meet the pervasive TBM challenge. Post-Gulf War analysis revealed that Patriot had some serious deficiencies that, fortunately, the Iraqis were unable to exploit. According to the U.S. General Accounting Office, the Army is highly confident that Patriot achieved warhead kills in only about 25% of Desert Storm engagements.[7] Some improvements have already been incorporated in Patriot, but it still has many limitations.

The JFC must look well beyond Patriot when planning force protection for any near-term conflict. Synchronization and coordination of all JTMD activities will bolster present defenses and provide the foundation for integration with robust future systems. Since theater defense is inherently a joint issue, joint doctrine will be used as the framework for analysis. JTMD doctrine employs four elements: active defense, to destroy missiles in-flight; passive defense, to minimize vulnerability to attack; attack operations, offensive fires to destroy missiles on the ground; and command, control, communications, computers, and intelligence (C4I) which serves to support the other elements by integrating joint force capabilities.

Regarding the first element, BMDO is presently developing an impressive hardware array of multi-tiered *active* defense missile systems that will incrementally provide the JFC

with an *(eventual)* near leak-proof defense against the TBM threat. It is important to appreciate the quantum leap in capabilities and protective coverage that these new active systems will provide, but it is also essential to understand that *full deployment and integration will not occur until late in the next decade.*

Consequently, a JFC searching for methods to improve JTMD readiness must look well beyond *systems* and *hardware* for effective solutions. The answers lie *not* in the means, but in the *ways*. A thorough examination of each element of JTMD, and use of a risk versus payoff analysis for employment considerations, will reveal several key areas where the JFC can direct actions, employing available assets, to improve operational force protection *now.*

DISCUSSION

Joint Theater Missile Defense Doctrine[8]

The TBM threat cannot be countered by any single technical solution or individual service component. Although one component of a joint force may predominate at a given time or in a particular space, the JFC must integrate and harmonize the collective capabilities of the joint force to produce the most effective defense against the TBM threat. Thus, the JFC's overall concept of operations, campaign objectives, and all phases of operational planning and execution must include JTMD. The common objective is to neutralize or destroy the enemy's theater missile (TM) threat (joint doctrine includes air-to-surface missiles, cruise missiles, and TBMs in the definition of TM). Thus, joint doctrine seeks to produce an *end state* that ensures the *freedom of action* to conduct joint operations without undue interference from enemy TM operations.

The four operational elements of JTMD (active defense, passive defense, attack operations, and C4I) are interrelated, mutually supportive, and normally conducted concurrently at the operational level. Each element is highly dependent on the simultaneous or sequential accomplishment of a wide spectrum of tasks and activities. Consequently, the challenge for the JFC is to coordinate and integrate all four elements and their associated efforts to achieve the operational objective. Only the carefully integrated and orchestrated application of all elements will achieve the level of success required for effective force protection.

Active Defense

Active defense includes those measures taken to destroy TBMs, and specifically their warheads, while they are still in-flight, and electronic warfare against remote or onboard guidance systems. An example of active defense is use of the Patriots during Desert Storm.

The "active defense resources and capabilities" section of Joint Pub 3-01.5 (JTMD doctrine) includes a discussion of considerations and advantages of destroying the just-launched TBM in the boost-phase, ascent, and mid-course phases respectively.[9] Other sections of active defense doctrine discuss "defense-in-depth," "multiple opportunities to negate the TMs," and the comment that "active defense should provide a means for real-time kill assessment."[10] A JFC studying the doctrine might comment "I don't have the systems to do *any* of this!" The JFC would be correct, at least until the next decade.

Patriot is a *terminal phase* (incapable of boost-phase or mid-phase intercept) *point* defense weapon that engages incoming TBMs at such a close range that there is insufficient time for a "shoot-look-shoot" employment doctrine (a "shoot-shoot-look" sequence is

normally employed). Patriot cannot provide a real time kill assessment. "Multiple opportunities" to negate incoming missiles implies a layered or multi-tiered active defense, composed of complementary *area* and point defense systems that, also, will not exist for several years.

Given the assumption that all of BMDO's complementary programs survive future budget cuts and the challenging technical aspects remain on track, the JFC will still not have an effective active defense for U.S. and allied maneuvering forces until delivery late in the next decade. To improve active defense, the JFC must focus on its operational aspects.

First, the JFC must realize that there are not enough Patriot assets to defend the entire theater. Resource limitations will force the JFC to assign available batteries to defend only *what is most important.*[11] Preparation of the commander's estimate will reveal friendly and enemy *centers of gravity* and critical vulnerabilities that will help guide this decision. The JFC must take into account that the political, psychological, or propaganda impact of TBMs may be greater than their military significance and deploy his scarce active defense resources accordingly. The risk to lower priority forces and areas that are not directly defended will have to be judged against the potential impact (military and political) of TBM attacks on critical areas. During Desert Storm, Patriot batteries needed in Saudi Arabia were instead deployed to Israel. These actions were taken to preclude the enormous strategic implications of involving Israel in the war, which would have disrupted the cohesion of the coalition thereby threatening the strategic center of gravity of allied forces.[12]

The determination of what is most important to defend may change during a campaign dependent on the phase of the operation. During initial force deployment operations, the vital

ports, airfields, marshalling areas, and logistics sites will be high value targets and demand the assignment of Patriots. In many regions, every potential forward port and airfield lies within the threat envelope of TBMs. If the JFC is unable to control the battlespace in and around these critical logistics areas, an early loss of initiative could occur.[13] If significant casualties or major loss of military equipment result, public and political support for strong U.S. action might melt away, jeopardizing the will to undertake the operation.[14] Therefore, the JFC must ensure that adequate numbers of Patriot batteries are in place to protect initial lodgment operations.

If, during pre-hostilities, Patriot resources are allocated but not yet assigned, the JFC should review the time-phased force deployment list and establish priorities based on urgency of need. If time is available, sealift assets are the most efficient method to transport Patriot systems; however, an unexpected escalation could rapidly occur forcing the JFC to balance the risk of attack against the cost associated with diverting airlift assets for the essential deployment of active defenses.[15]

Once deployment is complete and entry is assured, Patriot batteries should be redeployed to protect what *now* is most important in line with theater priorities. If possible, the JFC should attempt to prevent the adversary from knowing what is defended, to cause uncertainty and reduce the enemy's confidence in the outcome of TBM attacks.[16] Patriot batteries will become highly profitable targets for enemy fires or terrorist attack, and the JFC must take measures to ensure the security and protection of these scarce assets.

Thus, application of a risk management analysis to the various active defense employment options will empower the JFC to identify the assets most important to

defend--during each phase of operations--to make the optimum use of limited Patriot systems. Actions taken to ensure the security and protection of critical active defense resources is but one example in the wide range of *passive defense measures*--the next area of focus.

Passive Defense

Passive defense refers to the measures taken to minimize the effects of a TBM attack. Measures include actions taken to provide tactical warning, to reduce targeting effectiveness, to reduce vulnerability to attack, and to effect recovery and reconstitution. Passive defense covers an expansive gamut of tasks and activities and therefore must be planned by both operational and tactical unit commanders whenever forces may be threatened by TBM attack.

Indications and warning (I&W) of a TBM launch might come from defense satellite program (DSP) sensors, national or theater intelligence systems, or both. The JFC intelligence staff receives launch notification and, in turn, utilize theater C4I reporting systems to rapidly disseminate the alerts to the appropriate tactical units or population centers. Therefore, *tactical warning* serves as the *trip wire* to initiate passive defense measures, and usually to begin active defense and attack operations as well. Warnings can be general (notice that a TBM has fired) or specific (notice that a specific unit, city, or portion of battlespace is targeted for attack).[17]

Thus, the operational function of command and control is the means by which the JFC ties together and synchronizes the activities of all four JTMD elements to achieve unity of effort towards the operational objectives. For effective I&W, it is essential that theater reporting systems and the warning link with U.S. Space Command function flawlessly, and are near-real-time responsive. This architecture must be continually refined in peacetime joint and

multinational exercises. Ultimately, *seconds* will make the difference between success and failure. During the Gulf War, the average time-of-flight for a Scud launched from Iraq to Riyadh was only a scant 6 minutes,[18] leaving an incredibly small time-frame for early warning and reactive actions, and no time for indecision of error.

Passive measures to *reduce targeting effectiveness* include operations security (OPSEC), deception, and mobility. OPSEC measures seek to defeat the enemy's ability to acquire and identify potential friendly targets. Examples of OPSEC measures include camouflage, concealment, signature reduction (infrared, electromagnetic, and acoustic), and local unit security. Frequent movement of forces *inside the enemy's intelligence cycle* is one of the most important and effective OPSEC measures.[19]

During the initial deployment of forces, the JFC might contemplate measures to *conceal* major airlift or sealift offload points. In making this decision, the JFC must consider that the enemy will have access to commercial imagery and hiding such a large operation will be very difficult (and risky if adequate defenses are not available). On the other hand, hiding the deployment might negate the force's potential deterrent effect.[20]

Deception reduces targeting effectiveness by distorting and manipulating friendly actions to mislead the enemy. The deception effort should specifically counter or exploit the enemy's intelligence collection and battle damage assessment capabilities. For example, the effective use of decoys may contribute to the depletion of enemy TBM resources on false targets resulting in fewer or less dense attacks on intended targets.[21]

Operational mobility is the most effective measure to reduce targeting effectiveness as it abates exposure to targeting sensors and reconnaissance assets, complicates the targeting

problem, and slows down the opponent. In some theaters, the enemy's only source of force targeting information may be from time-late commercial imagery. The JFC should devise an operational scheme of maneuver that enables the exploitation of operational mobility--the capability of highly mobile forces to move outside of a TBM's lethal radius before the enemy can obtain the time-late targeting data[22]--while retaining the ability to achieve a positional advantage over the enemy in order to pursue the primary objectives. Since the operational depth of maneuver forces frequently causes them to operate outside of the protective coverage of Patriot, mobility and other passive measures will often be their only defenses against TBM attack.

Passive measures to reduce vulnerability to attack include hardening, NBC defense, redundancy, and dispersal. Hardening of military equipment is a responsibility of acquisition managers and must take place in peacetime. Construction of hardened military facilities, airfields, command and control nodes, etc. is very expensive and mostly dependent on the peacetime defense expenditure priorities of the host nation. If time and resources are available, several passive defense applications can reduce the vulnerabilities of typical military installations in underdeveloped theaters. Using an airfield example, construction of additional runways, fueling areas, arming areas, servicing and parking ramps, and hardening of aircraft shelters are just a few methods to multiply the number of aimpoints that a conventionally armed TBM attack must hit. Increasing the number of aimpoints will have an exponential effect on the number of TBMs required to render the facility unusable.[23] Obviously, there must be a balanced effort throughout the theater and the high cost of improvements will most likely result in hardening and redundancy for only the most critical facilities.

The JFC can best contribute to reduced vulnerability of *forces* by careful site selection, field fortifications, and other field expedient methods. Since even hardened sites may be contaminated by chemical or biological warheads, the theater commander must ensure that stockpiles of decontaminants are available, as well as protective clothing, detection devices, antidotes, and vaccines.

Dispersal of assets decreases friendly concentrations and reduces vulnerability. It complicates enemy search and targeting, and thus costs the enemy time and effort. Dispersion is applicable to logistical planning as well as to maneuvering forces. A JFC may use dispersion as a passive measure to ensure the survivability of logistical support. Dispersal will reduce risk, but at the expense of *economy of effort.*[24] If the risk justifies dispersal, then logistical planners must anticipate the negative impact of decentralization, and develop alternatives such as phased logistical support for force sustainment.

Attack Operations

The element of *attack operations* is not a mission in itself but a way of characterizing those actions taken to destroy or disrupt TBM launch capability. Attack operations include fires on launchers, missile storage areas, missile production sites, command and control nodes and infrastructure. Attack operations can be preemptive or in reaction to a TBM launch. JTMD doctrine states that "attack operations are challenging because TM systems are generally hard to detect since they normally will be dispersed, mobile, electronically quiet, and redundant."[25]

The massive Scud hunt during Desert Storm is an excellent example of the *difficulty* of this "*challenge*." While Iraq launched only 88 Scuds during the war, the coalition devoted

as many as 4,859 sorties against the Scud infrastructure and forces without achieving a single confirmed kill of a mobile launcher.[26] Although many of these sorties attacked secondary targets when unable to find the Scuds, the Scud hunt still diverted a significant number of multipurpose assets from accomplishing other missions. This diversion, by some estimates, delayed the commencement of the ground assault by six days.[27]

On the other hand, the constant pressure forced the Iraqis to set up and launch hurriedly (reducing accuracy), and constrained their attacks mostly to hours of darkness to prevent launcher detection by coalition fighters.[28] In this case, the *perception* of an all out effort was more important than the *effectiveness* of the Scud hunt. At the very least, the enormous effort definitely provided the impression that the coalition was addressing the problem and helped keep the alliance in tact, thereby protecting the coalition's *strategic center of gravity.*

In any case, attack operations will be extremely difficult; they will use the same assets, and be in direct competition with interdiction and other missions.[29] The JFC must *continually* assess how best to balance forces to achieve the operational objective. In many scenarios, special operations forces may have more capability to detect launchers than aircraft.

Mobile TBM launchers blend in among other hardware, vehicles, radios and radar emissions on the battlefield, and they hide quickly after launch making target acquisition the most formidable part of attack operations.[30] Although the sparse desert terrain was ideal for finding mobile launchers, Iraq successfully used dispersion, decoys, and hidden shelters to thwart all detection efforts. Hunting missiles in the mountainous regions of North Korea or the forests of Bosnia would prove even more difficult.[31]

BMDO is developing space-based sensors that will eventually pinpoint launch positions almost instantaneously; however, until these advanced detection systems are fielded, the JFC must realize that the shortcomings of present sensors will potentially limit the effectiveness of attack operations even when complete air supremacy is achieved. Thus, the JFC must plan branches to use assets such as special operations forces, unmanned aerial vehicles, tactical reconnaissance aircraft, and other secondary targeting sources if primary sensors are rendered ineffective.

Considering the many challenges and apparent low payoff, how much effort should the JFC devote to attack operations? To answer this question the JFC should weigh the effect enemy TBMs have on the *objective*. Proper application of the principle of economy of force will enable the JFC to focus the main effort on the *primary objective*, and not waste combat power on secondary aims. In Desert Storm, destruction of TBMs and WMDs was a primary strategic objective justifying the 4800 sorties apportioned for attack operations. If, in another scenario, TBMs do not significantly threaten the objective, attack operations might be judged too costly and the JFC may choose to employ only active and passive defensive measures.

If TBMs are the primary objective and a solution to the detection problem is achieved through technical means or intelligence methods, the JFC should apply the principle of *offensive* and take the initiative to destroy or neutralize the enemy's TBM capability at the earliest possible opportunity. Failure to exploit offensive action early will result in *diminishing returns* as the conflict progresses since the enemy will likely launch many TBMs at friendly targets and protect remaining assets through dispersal and concealment to avoid their detection. Consideration of preemptive attack would apply in situations where war was

inevitable, and the JFC believed the best chance for success was to strike first, before conditions on the battlefield changed.

In sum, employing attack operations to destroy an opponent's TBM capability before it can be used is, by far, the most desirable method of providing force protection; yet, due to detection and targeting challenges, it is clearly the most difficult to execute. Having examined the individual elements of active defense, passive defense, and attack operations the focus will now shift to the element of C4I--the "glue" that binds the other elements together.

Command, Control, Communications, Computers, and Intelligence (C4I)

C4I serves as the common link enabling the integration and coordination between the remaining elements of JTMD. This element supports the total span of JTMD activities from tasking sensors, detecting targets, disseminating warnings, controlling fires, to evaluating post-strike assessments.[32] Unity of effort in C4I requires absolute technical and procedural *interoperability* of all components from the various land, air and naval forces. The nature of JTMD makes it imperative that C4I provide *near-real-time* communications and data transfer between intelligence assets, decision makers, warning systems, and shooters.[33]

Intelligence preparation of the battlespace (IPB) is a continuing process, begun in peacetime, that identifies enemy TBM capabilities, vulnerabilities, and probable courses of action. The process reduces uncertainties about the terrain, environment, enemy order of battle, and employment techniques.[34] IPB serves as the foundation for all JTMD planning efforts and is especially vital to effective planning for attack operations and active defenses. It is very important for the JFC and staff planners to base evaluations on what the enemy is physically *capable of doing* and not on the opposing commander's postulated courses of

action, as it is not only impossible to identify enemy *intentions* with confidence, but the enemy could always change his course of action. Therefore, a focus on enemy capabilities will ensure the proper consideration of all *possible* enemy courses of action.

Planning for C4I begins with the commander's estimate and should be *continually* coordinated among all joint force components. The concept of operations will specify the objectives and include the commander's guidance. The guidance must *prioritize* JTMD efforts by establishing what critical friendly assets must be protected by active defense systems, and identifying enemy targets that are most important for attack operations. JTMD resource apportionment decisions are largely based on these priorities, and they, also, should be included in the guidance. In addition, the guidance should also include: component-to-component coordination to facilitate deconfliction and prevent fratricide; utilization of joint targeting coordination board (if applicable); and, coordination of with allies and/or civilian authorities in preparing plans for JTMD since civilian population centers are likely to be a major targets of TBM attacks.[35]

One of the most important decisions that a JFC faces regards the establishment of command relationships. Who will have overall responsibility for control of JTMD? Is it better to establish a dedicated component commander responsible for theater missile defense or to additionally task the area air defense commander (AADC) or joint force air component commander (JFACC) with JTMD? Normally, the JFC will designate a JFACC, an AADC, and an airspace control authority (ACA). Joint doctrine remarks that the most preferable situation is that the AADC and ACA functions are performed by the same person, who may also be the JFACC.[36] If the AADC, ACA, and JFACC functions are assigned to the same

person, this arrangement ensures integrated operation of all air assets providing *unity of effort* in the accomplishment of the overall mission.

The counter argument is that, depending on the size and scope of the problem, the JFACC may become task-saturated while prosecuting JTMD at the expense of offensive air operations, and thus, proposes the creation of a component commander (TMDCC) entirely dedicated to JTMD efforts.

The best solution is to create a deputy to the JFACC responsible for JTMD as well as the functions of AADC and ACA. This arrangement maintains continuity since assets for attack operations are normally apportioned by JFACC as operational fires by air power. In addition, it reduces the JFACC's task-saturation level while still maintaining unity of effort. The establishment of a dedicated JTMD component commander would result in spirited competition for air assets at the component commander level that invariably would disrupt the apportionment process, reduce centralized control, and result in duplication of effort in some cases. The JFACC, with an energetic deputy, is in the best position to coordinate with the other components to ensure that the overall JTMD effort is fully integrated, synchronized, and responsive.

Due to the inherent time-critical nature of JTMD, the JFC must establish rules-of-engagement (ROE) which will enable decentralized execution to occur almost instantaneously upon detection of TBM launch or acquisition of a mobile launcher. JTMD ROE planning should develop a "*trigger event*" criterion to optimize responsiveness. "Trigger events" could be detection of a TBM launch or related signature by any means, or visual or sensor detection of a mobile launcher. Under these ROE, observance of a "trigger event"

enables active defense and attack operations assets to act immediately to engage the threat without further clearance from centralized authority. This proposal is not intended to imply that the "trigger event" would stand alone as the only factor in the engagement decision, but that it would be incorporated into a clear and concise set of circumstances, and limitations, which would collectively support, not inhibit, decentralized mission accomplishment. Inclusion of this *type* of ROE criterion will facilitate centrally controlled, decentrally executed operations while ensuring the most rapid and effective use of JTMD resources.[37]

Finally, it is important for the JFC to take advantage of every opportunity to exercise and rehearse JTMD in multinational exercises with full participation of C4I assets. Exercises will test the selected command relationships, improve overall responsiveness, and continuously reveal additional training, interoperability, and procedural issues for peacetime resolution.

CONCLUSIONS

The significant threat posed by TBMs is unlikely to be countered by efforts to halt proliferation, at least not in the near-future. Continued technical improvements to missiles and targeting systems will have the opposite effect--they will make TBM possession even more attractive to developing nations. Even when an adversary's naval, air, and sea forces are paralyzed by the overwhelming combat power of friendly forces, the enemy can still use missile forces as an offensive or terror instrument. The threat will spread, become more deadly, and further destabilize many regions in the world. In future conflicts, we are likely to face an enemy that may be willing to employ WMD and disposed to use large numbers of

TBMs early in the conflict to deny ports and airfields essential to follow-on deployment of friendly forces.

While Desert Storm was occurring, it was easy to get the impression that the Patriot could answer the TBM threat. However, critical post-war studies revealed many serious deficiencies in Patriot performance. The coalition's success against Scuds, to a large degree, was due more to the primitive nature of the missiles and their incompetent employment than a result of Patriot effectiveness.

Fortunately, the United States has fully recognized the significance and priority of this threat and has devoted significant funds to field future active defense systems that promise an order of magnitude increase in capabilities to defeat all present and projected TBMs. Although a lower-tier system has been funded for the U.S. Navy, it is imperative that the Navy obtain an upper-tier capability as well. Naval forces will often be first on the scene and must maintain the capability to command the littoral battlespace.

To optimize the effectiveness of JTMD, the JFC must focus on *operational considerations*--especially in the *use of operational functions* that the JFC can employ now--instead of hardware. Emphasis must be on the successful *coordination and integration of all elements* of JTMD and the pertinent operational functions, which can only be achieved through a proper application of operational art. Key decisions must be made beginning early in the planning process, and throughout every phase of operations, that ultimately will determine the success or failure of the overall JTMD effort. JTMD doctrine provides a useful framework for these decisions, but the JFC retains sufficient leverage to adapt JTMD to specific theater requirements. Command relationships, threat priorities, ROE, logistics, and

apportionment are examples of critical JTMD decision areas that can be used to tailor force protection to particular contingencies or individual theater needs. The JFC should regularly exercise the entire JTMD architecture to increase its responsiveness, and to verify the complete integration of all operational elements after incorporation of any significant changes.

NOTES

[1]William D. Smith, "Theatre Ballistic Missile Defence for Europe," NATO's Sixteen Nations, May-June 1993, 45.

[2]Scott T. Hutchinson, "Army and Navy Theater Missile Defense: Protecting the Force," Military Review, March-April 1995, 51.

[3]William C. Story, Third World Traps and Pitfalls: Ballistic Missiles, Cruise Missiles, and Land Based Airpower, (Maxwell Air Force Base, AL: Air University Press 1995), 37.

[4]George P. Garrett, "The Emerging Tactical Ballistic Missile Threat," Marine Corps Gazette, May 1993, 76.

[5]Michael E. Ellis and Jeffrey Record, "Theater Ballistic Missile Defense and U. S. Contingency Operations," Parameters, Spring 1992, 11-12.

[6]William D. Smith, "Creating Defenses Against Theater Ballistic Missiles Is An Awesome Challenge," Sea Power, January 1994, 12.

[7]U.S. General Accounting Office, Operation Desert Storm: Data Does Not Exist to Conclusively Say How Well Patriot Performed, Report to Congressional Requesters (Washington: 1992), 2-4.

[8]The discussion in this segment is based on Joint Chiefs of Staff, Doctrine for Joint Theater Missile Defense, JOINT PUB 3-01.5 (Washington: 1996), Chapters I-III.

[9]Joint Chiefs of Staff., JOINT PUB 3-01.5, III-7, III-8.

[10]Ibid., III-7, III-8, III-10.

[11]Ibid., III-9.

[12]W. Seth Carus, Ballistic Missiles in Modern Conflict (New York: Praeger 1991), 81.

[13]John Gordon, "An Army Perspective of Theater Missile Defense," Proceedings, July 1995, 42.

[14]Jay M. Garner, "Working at Top Speed To Bolster Theater Missile Defense", Army, October 1995, 150.

[15]Joint Chiefs of Staff, JOINT PUB 3-01.5, III-2.

[16]Ibid., III-9.

[17]Ibid., III-5.

[18]Clifford Beal, "Racing to Meet the Ballistic Missile Threat," International Defense Review, March 1993, 211.

[19]Joint Chiefs of Staff, JOINT PUB 3-01.5, III-5.

[20]Garrett, 80.

[21]Joint Chiefs of Staff, JOINT PUB 3-01.5, III-5.

[22]Garrett, 80.

[23]James L. Bonomo and James A. Thomson, The Promise of Passive Defenses (Santa Monica, CA: Rand 1987), 11-14.

[24]Joint Chiefs of Staff, Doctrine for Logistic Support of Joint Operations, JOINT PUB 4-0 (Washington: 1995), II-2.

[25]Joint Chiefs of Staff, JOINT PUB 3-01.5, III-11.

[26]Ronald E. Adams, "Army Aviation in Theater Missile Defense," U.S. Army Aviation Digest, September/October 1994, 2.

[27]Ellis and Record, 12.

[28]U.S. Congressional Budget Office, The Future of Theater Missile Defense (Washington: 1994), 34.

[29]Charles R. Rash and Robert F. Larsen, "The Field Artillery and Theater Missile Defense," Field Artillery, June 1994, 15.

[30]Gordon, 42.

[31]U.S. Congressional Budget Office, 34.

[32]Louis C. Wagner, "Theater Missile Defense," Army, November 1994, 26.

[33]Joint Chiefs of Staff, JOINT PUB 3-01.5, III-14.

[34]Ibid., II-1 - II-4, and III-15.

[35]Ibid., II-2, Chapter III.

[36]Ibid., II-5.

[37]Ibid., III-10 - III-12, and III-14 - III-17.

BIBLIOGRAPHY

Adams, Ronald E. "Army Aviation in Theater Missile Defense." U.S. Army Aviation Digest, October 1994, 1-2.

Beal, Clifford. "Racing to Meet the Ballistic Missile Threat." International Defense Review, March 1993, 209-215.

Blau, Tom. "TMD in the Clinton Era." Military Technology, July 1993, 16-23.

Bonomo, James L. and James A. Thompson. The Promise of Passive Defenses. Santa Monica, CA: Rand, 1987.

Carus, W. Seth. Ballistic Missiles in Modern Conflict. New York: Praeger, 1991.

Ellis, Michael W. and Jeffrey Record. "Theater Ballistic Missile Defense and U.S. Contingency Operations." Parameters, Spring 1992, 11-26.

Evers, Stacey. "Fragmented Efforts Can Damage TMD." Army, December 1993, 31-33.

Garner, Jay M. "Working at Top Speed To Bolster Theater Missile Defense." Army, October 1995, 149-154.

Garrett, George P. "The Emerging Tactical Ballistic Missile Threat." Marine Corps Gazette, May 1993, 75-81.

Goodman, Glen W. "Unfurling a Leakproof Umbrella: Navy Theater Ballistic Missile Defense's Time Has Come." Armed Forces Journal International, April 1995, 22-25.

Gordon, John. "An Army Perspective of Theater Missile Defense." U.S. Naval Institute Proceedings, July 1995, 40-43.

Hewish, Mark and Clifford Beal. "Scudkillers: Tough Choices for Boost-Phase Intercept." Jane's International Defense Review, January 1996, 28-34.

Hutchinson, Scott T. "Army and Navy Theater Missile Defense: Protecting the Force." Military Review, March-April 1995, 50-57.

Horner, Charles A. "Space Systems Pivotal to Modern Warfare." Defense 94, Issue 4, 20-29.

Joint Chiefs of Staff. Doctrine for Joint Operations. JOINT PUB 3-0 Washington: 1995.

_____. Doctrine for Joint Theater Missile Defense. JOINT PUB 3-01.5 Washington: 1996.

_____. Doctrine for Logistic Support of Joint Operations. JOINT PUB 4-0 Washington: 1995.

Litchfield, Bruce A. "Theater Ballistic Missile Defense: The Need for an Operational Commander." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1995.

Martin, David C. and John Walcott. Best Laid Plans: The Inside Story of America's War Against Terrorism. New York: HarperCollins, 1988.

O'Neill, Malcolm R. "Ballistic Missile Defenses: Paths of Protection." Defense 95, May-June 1995, 15-26.

Rash, Charles R. and Robert F. Larsen. "The Field Artillery and Theater Missile Defense." Field Artillery, June 1994, 15-17.

Roberts, Guy B. "An Elegant Irrelevance: The Anti-Ballistic Missile Treaty in the New World Disorder." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1995.

Rubenson, David and Anna Slomovic. The Impact of Missile Proliferation on U.S. Power Projection Capabilities. Santa Monica, CA: Rand, 1990.

Shaver, Russell D. and Richard F. Mesic. Calculating the Utility of Attacks Against Ballistic Missile Transporter-Erector-Launchers. Santa Monica, CA: Rand, 1995.

Smith, William D. "As Sophisticated Weapons Proliferate, More Than Ever the Navy Needs to Be Ready." Sea Power, January 1995, 56-63.

_____. "Creating Defenses Against Theater Ballistic Missiles Is An Awesome Challenge." Sea Power, January 1994, 12-13.

_____. "Theatre Ballistic Missile Defence For Europe." NATO's Sixteen Nations, May-June 1993, 45-51.

Story, William C. Third World Traps and Pitfalls: Ballistic Missiles, Cruise Missiles, and Land-Based Airpower. Maxwell Air Force Base, AL: Air University Press, 1995.

U.S. Congressional Budget Office. The Future of Theater Missile Defense. Washington: 1994.

U.S. General Accounting Office. Ballistic Missile Defense: Computation of Number of Patriot PAC-3 Interceptors Needed Is Flawed. Report to Congressional Requestors. Washington: 1995.

_____. Ballistic Missile Defense: Evolution and Current Issues. Report to the Chairman, Committee on Governmental Affairs, U.S. Senate. Washington: 1993.

_____. Ballistic Missile Defense: Information on Theater High Altitude Area Defense (THADD) System. Briefing Report to the Chairman, Committee on Foreign Relations, U.S. Senate. Washington: 1994.

_____. Operation Desert Storm: Data Does Not Exist to Conclusively Say How Well Patriot Performed. Report to Congressional Requesters. Washington: 1992.

Wagner, Louis C. "Theater Missile Defense." Army, November 1994, 25-27.

Wirtz, James J. Counterforce and Theater Missile Defense: Can the Army Use an ASW Approach to the Scud Hunt? Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, 1995.