

Strategy Research Project

STRATEGIC RESPONSIVENESS – DOES JOINT FORCE CAPABILITY SUPPORT NATIONAL SECURITY STRATEGY?

BY

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USAWC STRATEGY RESEARCH PROJECT

**STRATEGIC RESPONSIVENESS – DOES JOINT FORCE CAPABILITY SUPPORT
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ABSTRACT

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Beginning in 2001, the National Defense Strategy changed as DOD began implementing capabilities-based planning and strategy and by moving to an expeditionary force primarily based in the continental United States. This and each subsequent change in national defense strategy increasingly required a strategically responsive joint force to support U.S national strategy. Research shows the strategic responsiveness of the joint force has not evolved simultaneously with strategy to meet requirements for the military's two fundamental tasks to deter and wage war in support of US national policy and national strategy. The result is a gap between the strategy and the means to achieve it. This research project examines the evolution of strategy since 2001; examines the impact on the strategic responsiveness of the joint force; identifies the need for a comprehensive review to ensure strategic responsiveness supports the national strategy; and makes recommendations for its improvement.

STRATEGIC RESPONSIVENESS – DOES JOINT FORCE CAPABILITY SUPPORT NATIONAL SECURITY STRATEGY?

The fundamental purpose of military power is to deter or wage war in support of national policy.

—Capstone Concept for Joint Operations,
Version 3.0, 15 Jan 09

The CCJOv3 lists three enduring conditions for the current and future joint operating environment – the unruly nature of the international political system, America's status as a global power with global interests, and the need to conduct and sustain U.S. joint operations at global distances.¹ The combination of these three enduring conditions requires the joint force to be strategically responsive to successfully achieve its two fundamental tasks to deter war and wage war. Strategic responsiveness gives the U.S. the ability to deliver the joint force to the right places at the right times with the right mix of forces to swiftly and decisively defeat an adversary and achieve U.S. strategic objectives across all spectrums of conflict. Strategic responsiveness of the joint force derives its agility from a combination of three components – forward presence forces, strategic mobility, and pre-positioned forces.² In order to maintain strategic responsiveness, the combination of these components must evolve as U.S. national strategy evolves.

The strategic responsiveness of the joint force has not evolved simultaneously with strategy to meet requirements for the military's two fundamental tasks in support of both U.S. national policy and national strategy. Although the components of strategic responsiveness have adjusted, the question is whether the adjustments were based on strategy or expediency. This research project examines the evolution of strategy since 2001; examines the impact on the strategic responsiveness of the joint force; and

identifies the broad effects of the changes. This project identifies the need for a comprehensive review to ensure the strategic responsiveness of the joint force supports the national strategy and then makes recommendations for its improvement.

In June 2008, the Department of Defense published the latest National Defense Strategy (NDS). The 2008 NDS is the most recent in a long line of official strategy publications since World War II that outlines the way ahead for protecting U.S. national interests around the globe. Variations in U.S. national defense strategies, from the bipolar world after World War II to the world today, were all enabled by a common thread - strategic responsiveness. It enabled the U.S. to pursue its strategic objectives from the Berlin Airlift in 1948 to Operations Enduring Freedom and Iraqi Freedom. These and many other operations shown in Figure 1³ are examples where the strategic responsiveness of the joint force supported U.S. national strategy.



Figure 1 - U.S. Operations Since 1945

Since 2001, the U.S. Department of Defense has implemented defense transformation while simultaneously fighting a protracted war in Afghanistan and Iraq. Both defense transformation and fighting the Long War⁴ are intensive endeavors in resources and time when executed individually. The simultaneous execution of both has

been difficult and not always complimentary to the success of each effort. Challenges, resource constraints, and sheer velocity of events coupled with the rapid evolution of national defense strategy since 2001 resulted in negative effects on the strategic responsiveness of the joint force. Over the next year, the new U.S. administration will develop and publish its National Security Strategy and a Quadrennial Defense Review Report. Now is the appropriate time to review where we are and determine the way ahead to maintain strategic responsiveness in the joint force.

Generally, he who occupies the field of battle first and awaits his enemy is at ease; he who comes later to the scene and rushes into the fight is weary.⁵

This simple statement by the Chinese strategist Sun Tzu in approximately 500 BCE illustrates why strategic responsiveness is critical to the joint force. Sun Tzu's message represents more than simply getting to the battlefield first. It represents the goals for strategic responsiveness. These goals⁶ are more than just strategic mobility⁶, force projection⁷, or force closure⁸. Strategic responsiveness applies across all spectrums of conflict and allows the joint force to select the locations, methods, and times which are most advantageous while minimizing the adversary's ability to affect joint force operations. If the national strategy successfully defends the homeland first, the joint force will always play 'away games' yielding the home field advantage to adversaries. Strategic responsiveness allows the joint force to negate the adversaries' 'home field' advantage by retaining the initiative and by delivering the joint force rapidly and decisively while operating inside the adversaries' decision cycle and response time.

The appropriate combination of forward presence forces, strategic mobility, and pre-positioned forces provides the most strategically responsive force to deal with the variety of threats and challenges in the contemporary and future operating environment.

In a perfect world of unconstrained resources, the decisions about the correct combination are insignificant and inconsequential. However in the normal resource constrained world, decisions regarding the appropriate combination of its components are critical to maintain strategic responsiveness. These decisions are especially crucial given the long lead times and considerable expense involved in making significant changes or establishing new capabilities in these components. In determining the correct mix to maintain strategic responsiveness, the DOD must determine requirements based on U.S. strategy, national interests, challenges, and threats in the mid-term and long term time frames.⁹

Evolution of the Global Defense Posture and Strategic Responsiveness

The end of World War II left the U.S. with a global military capability located in numerous allied and defeated countries. As the strategic environment evolved from a 'hot' war against fascism into a Cold War designed to contain communism, the U.S. global defense posture evolved from post-WWII occupation duties to strategic containment of communism and deterrence. As the international environment evolved, so did U.S. strategy and the global defense posture. The U.S. maintained strategic responsiveness through a combination of forward presence of units overseas, strategic mobility systems, and pre-positioned stocks of equipment and supplies.¹⁰ During the Cold War, military power was primarily designed to defeat a Warsaw Pact attack in Central Europe and an attack in North East Asia. As U.S. national strategy changed and new technologies developed, the three components of strategic responsiveness adapted but remained focused on responding primarily to threats against Central Europe and North East Asia. U.S. strategic responsiveness remained relatively stable

until the late 1970s and early 1980s when increased U.S. national interests in South West Asia led to improved access in the SWA region, Africa, and the Indian Ocean.

With the end of the Cold War, reviews of U.S. national strategy changed the global defense posture. In the early 1990s, total U.S. military forces were reduced by over 20%¹¹ as a peace dividend at the end of the Cold War. The majority of force reductions were made in forward presence forces with corresponding reductions in forward facilities.¹² Following these reductions, U.S. global defense posture remained essentially unchanged until 2001 with the publication of the Quadrennial Defense Review (QDR) on September 30, 2001.

The 2001 QDR initiated two significant strategy shifts in U.S. global defense posture. One major shift was from threat-based planning and strategy to a new capabilities-based planning and strategy. The shift to capabilities-based planning and strategy reflected the end of the Cold War and recognition that challenges to U.S. interests and allied interests could come in many forms and more locations than before. A capabilities-based strategy required DOD to focus “more on how an adversary might fight than who the adversary might be and where a war might occur.”¹³

The second major shift was from two relatively static defensive plans in North East Asia and Europe to a 1-4-2-1 force planning construct. The 1-4-2-1 force planning construct was (1) defend the homeland, (4) operate in and from four forward regions of Europe, Northeast Asia, East Asian littoral, and Southwest Asia to assure allies and friends, dissuade competitors, and deter aggression and counter coercion; (2) swiftly defeat two adversaries in overlapping military campaigns and (1) preserve for the President the option for a decisive and enduring result in one operation including regime

change and occupation.¹⁴ Secretary of Defense Donald Rumsfeld further established joint swiftness goals of 10/30/30 requiring the joint force to seize the initiative in ten days, swiftly defeat the enemy in 30 days, and within another 30 days be prepared to shift military resources to another area of conflict.¹⁵

Three years later in 2004, the Department of Defense subsequently completed the Integrated Global Presence and Basing Strategy (IGPBS). The IGPBS further reduced forward presence forces and increased reliance on expeditionary forces primarily based in the continental U.S. (CONUS). Forward presence military personnel were reduced from approximately 197,000 to approximately 127,000 with the bulk of the cuts in Army personnel while reducing overseas infrastructure from over 850 to approximately 550 facilities.¹⁶ This significantly reduced the availability of forward presence forces for contingencies.

The 2005 NDS continued the 1-4-2-1 force planning construct but also recognized four DOD strategic objectives: secure the U.S. from direct attack, secure strategic access and retain global freedom of action, strengthen alliances and partnerships, and establish favorable security conditions. The methods to accomplish these objectives were essentially the same as the 2001 QDR. The 2005 NDS reinforced the need for strategic responsiveness to support the four objectives and stated a requirement for the joint force to operate worldwide.

The 2006 QDR changed the 1-4-2-1 force planning construct due to U.S. commitments in Iraq, Afghanistan, and elsewhere. It required the joint force to operate globally - not just in the four forward areas of Europe, the Middle East, the East Asian littoral, and North East Asia. The 2006 QDR emphasized preparing for the uncertainty of

the strategic environment, countering asymmetric challenges, and waging irregular warfare in long duration conflicts. The report also required accelerated transformation to a capabilities-based force able to respond to global challenges across the spectrum of conflict illustrated in Figure 2. The 2006 QDR identified four security challenges that threatened U.S. interests - Traditional, Irregular, Catastrophic, and Disruptive.¹⁷ It emphasized responding to Irregular, Catastrophic, and Disruptive challenges due to already established U.S. dominance and superiority in Traditional forms of warfare.¹⁸ This QDR refined the Force Planning Construct into three objective areas of Homeland Defense, War on Terror/Irregular Warfare, and Conventional Campaigns with focused efforts to increase capabilities in support of these objectives.

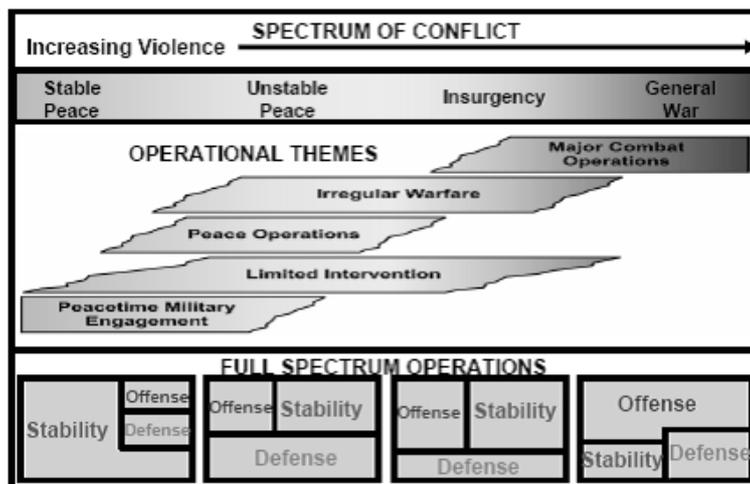


Figure 2 – Spectrum of Conflict

The most recent NDS published in June 2008 identifies five DOD strategic objectives: Defend the Homeland, Win the Long War, Promote Security, Deter Conflict, and Win Our Nation's Wars. To achieve these objectives, the 2008 NDS uses five methods. These methods are shape the choices of key states; prevent adversaries from acquiring or using WMD; strengthening and expanding alliances and partnerships;

securing U.S. strategic access and retaining freedom of action; and integrating and unifying U.S. efforts. This strategy also relies on strategic responsiveness to support achievement of the objectives.

Impact on Strategic Responsiveness of the Joint Force

With each evolution or change in strategy, a review of current and projected joint force capabilities to meet the objectives and goals should have been completed. The evolutions in strategy necessitated reasoned changes in the three components of strategic responsiveness to maintain viability and meet strategic objectives.

Unfortunately, the rapid evolution and changes since 2001 occurred at a pace that inhibited evaluations of abilities to execute the strategy. In some instances, decisions were implemented before supporting initiatives were emplaced due to the lead time and cost to prepare. Evidence indicates that the changes to the components of strategic responsiveness have not consistently used a reasoned approach comparable to the strategy it supports. Ultimately, the rapid evolution of strategy negatively impacted the strategic responsiveness of the joint force. The impacts to forward presence forces, strategic mobility, and pre-positioned stocks are addressed separately below.

Impact on Forward Presence Forces

Forward presence forces are a basic component of the U.S. ability to project military power and pursue military operations outside CONUS. Besides their military power, “forward presence forces strengthen U.S. diplomacy and foreign policy; demonstrate U.S. commitment to the security of America’s friends and allies; and demonstrate to any potential challengers U.S. resolve to deter aggression and meet our

commitments.”¹⁹ Depending on where a contingency occurs, forward presence forces may be closer to the contingency subsequently reducing response time to the area.

Though reductions were made in the early 1990s, substantial numbers of forward presence forces remained based on a legacy posture from the Cold War focused on Europe and North East Asia. In 2004, DOD issued and implemented IGPBS transforming the global defense posture. The goal of IGPBS was to improve the ability to meet alliance commitments, position U.S. forces to better meet 21st century challenges, especially the War on Terrorism, and ease the operational tempo for armed forces members and their families.²⁰ Based on the QDR 1-4-2-1 force planning construct, U.S. forces were to reposition regionally in Europe, Northeast Asia, the East Asian littoral, and Southwest Asia. In reality as shown in Figure 3²¹, the IGPBS plan reduced forward presence forces by 36%.²²

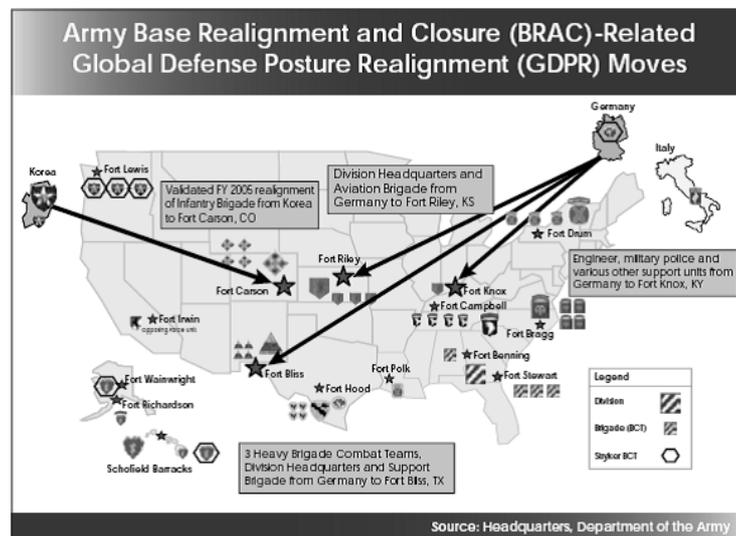


Figure 3 – IGPBS DIV/BCT Moves to CONUS

The IGPBS plan also proposed creation of a network of three installation types better suited to support an expeditionary military structure. These three types consisted

of Main Operating Bases (MOB), Forward Operating Sites (FOS), and Cooperative Security Locations (CSL). A MOB consists of permanently assigned forces with family members and robust infrastructure such as schools, family housing, as illustrated by Ramstein AFB in Germany, Kadena AFB in Japan, and Camp Humphreys in South Korea. A FOS is an austere, expandable facility with a limited permanent military presence and potentially pre-positioned equipment that supports rotational forces that deploy for up to a year without family members. An FOS is used to support regional engagement, bi- or multi-lateral training, and regional crises. Soto Cano Air Base in Honduras, Camp Bondsteel in Kosovo, and Manas Air Field in Kyrgyzstan are examples of FOSs. A CSL is an austere, expandable facility without permanent military forces and operated by host nation personnel or contractors. CSLs are used for regional access in the event of a crisis. An example of a CSL is Dakar, Senegal used as a staging area for peace support operations in Liberia in 2003.²³

In an August 2005 report, the independent Overseas Basing Commission (OBC) criticized the IGPBS for failing to be a coordinated and integrated plan and identified several issues with the plan's development and implementation. The most significant issues include lack of synchronization and integration among U.S. government agencies; synchronization and timing of decisions between ongoing operations and analytical efforts; and lack of funding and planning for consequences of execution.

The OBC found that the proposed realignment of the global defense posture was not properly staffed nor coordinated with all affected U.S. government agencies.²⁴ The OBC concluded that the basing of U.S. military forces was intimately linked to other elements of national power because it indicates U.S. security interests and U.S.

presence influences other nations. Consequently, decisions on force basing must not be a “DOD only” process but must include interagency perspectives such as the Department of State. The OBC recommended an interagency process be established to examine and synchronize the process.

The OBC criticized the synchronization and timing of the 2004 IGPBS because it was largely based on the 2001 QDR report which was outdated by 2004. The 2001 QDR had been effectively completed prior to the September 11, 2001 terrorist attacks as well as before operations in Afghanistan and Iraq began.²⁵ The OBC concluded a more thorough strategy review was required given the simultaneous execution of military transformation, the wars in Iraq and Afghanistan, and, at the time of the OBC report, a yet to be completed QDR, Base Closure and Realignment Commission (BRAC) report, and Mobility Capability Study.²⁶

The OBC report also found challenges with DOD funding of several critical efforts. The simultaneous execution of service transformation, ongoing operations in Iraq and Afghanistan and resetting service forces and equipment competed with IGPBS and the 2005 Base Realignment and Closure results for funding resulting in adverse impacts to the programs. Additional funding was required but not requested nor programmed to support increased strategic mobility systems, pre-positioned stocks of equipment, facility construction at new unit locations, nor facilities at new MOB, FOS, and CLS sites to support the expeditionary forces based in CONUS. The OBC estimated a cost of \$20 billion to implement IGPBS moves alone while only \$4 billion was budgeted for the period 2006-2011 resulting in potential diversion of funds from service operations and maintenance accounts.

Impact on Strategic Mobility

Strategic mobility consists of both airlift and sealift to move the joint force from its respective bases to the theater. Airlift provides the ability to rapidly move forces and supplies to theater but is limited by its volume or capacity and is the most costly mode of transportation. Sealift possesses the volume and capacity to deliver bulk quantities of forces and supplies but is slower delivering to theater. The time available to deploy and assemble the joint force is a significant consideration in determining capability. DOD's 10/30/30 joint swiftness goals require the joint force to seize the initiative in ten days, swiftly defeat the enemy in 30 days, and be prepared within another 30 days to shift military resources to another area of conflict. Such rapid shifting of forces represents a significant challenge. For perspective, in the Gulf War the first mechanized division to arrive was not fully in theater until 47 days after the deployment began.²⁷ Given the results of the five month buildup to Desert Storm and the two month buildup of forces to Operation Iraqi Freedom, it is unlikely future adversaries will allow significant amounts of time for the joint force to deploy prior to commencement of hostilities.

The challenge of deploying the joint force becomes even more significant given the impact of the IGPBS's global defense posture. Within the next two years, the IGPBS plan will be complete and the majority of Army brigade combat teams (BCTs) will be located in CONUS. The Army will have three BCTs located outside the U.S. with one heavy BCT (HBCT) in Korea, one infantry BCT (IBCT) in Italy, and one Stryker BCT (SBCT) in Germany. Additionally, the Army will have four BCTs outside CONUS but still on U.S. territory with one SBCT and one IBCT each in both Alaska and Hawaii. The result is the remaining 41 regular Army BCTs will be based in CONUS including 18

HBCTs and 3 SBCTs. Figure 4 shows the location of BCTs and support brigades upon completion of IGPBS in FY13.²⁸

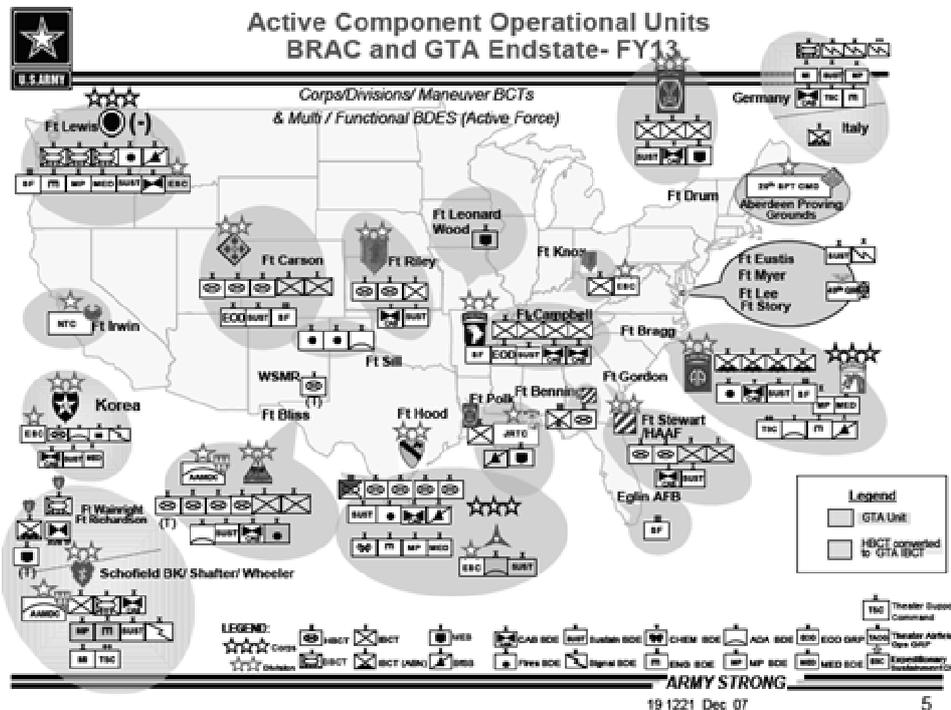


Figure 4 - FY13 End State for AC Units

HBCT and SBCT locations are significant due to their strategic mobility requirements to move into a theater. Deploying a single SBCT via airlift requires 298 C-17 sorties or 1 Large Medium Speed Roll-On/Roll-Off (LMSR) ship. Deploying a single HBCT via airlift requires 410 C-17 sorties or 1.4 LMSRs.²⁹ Strategic lift requirements for HBCTs and SBCTs are significantly more than for IBCTs which varies from 94 to 106 C-17 sorties and approximately 0.6 LMSRs.³⁰ The IBCTs provide rapid strategic mobility but limited tactical mobility and less offensive power than a SBCT or HBCT. The SBCT is essentially a medium brigade equivalent between an IBCT and an HBCT. The SBCT requires less strategic mobility than an HBCT but has superb tactical mobility and significant offensive capability with the Stryker vehicle systems including a limited

armor-defeat capability. The HBCT is slower to arrive because it requires the most strategic mobility due to its tanks and mechanized infantry systems but has excellent tactical mobility and also has the greatest offensive striking power. A comparison of aircraft and sealift required to deploy is shown in Table 1.³¹ Even a FCS BCT requires 340 C-17s to deploy via C-17. A deploying joint force will likely consist of a mixture of BCT types based on the threat and to provide operational flexibility to the joint force. Figure 5 is from a 2003 study³² that compared deployment times for various BCT types. If CONUS based BCTs deploy using 40% of the airlift fleet, an HBCT requires 12 days while an SBCT requires 8 days and an IBCT takes only 3 days. To illustrate how pre-positioned stocks improve deployability, an SBCT deployment time drops to 4 days using 13% of the airlift fleet if pre-positioning of some equipment is used.

Number of BCT Unit Loads by Air and Sea				
BCT TYPE	STONS	C-17*	LMSR*	FSS*
Heavy Brigade Combat Team	25000	410	1.4	3.0
Stryker Brigade Combat Team	13400	298	1.0	2.0
Infantry Brigade Combat Team	6000	106	0.6	1.0
FCS Brigade Combat Team	18700	340	0.9	1.6
*Approximations - exact requirements vary depending upon unit equipment on hand				
LMSR = Large Medium Speed Roll-on/Roll-Off Ship				
FSS = Fast Sealift Ship				

Table 1 - BCT Unit Loads for Deployment by Air or Sea

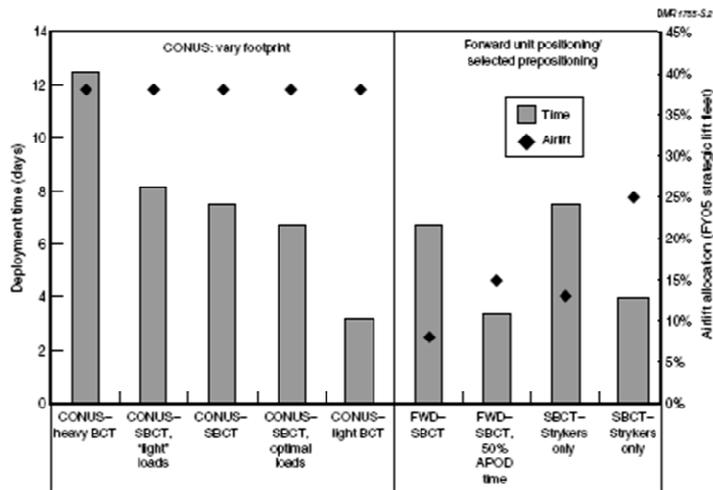


Figure 5 - Deployment in Days by BCT Type

Since the end of the Cold War, DOD has performed four studies to identify strategic mobility requirements because of changes in national security strategy. Each study uses models to evaluate warfighting scenarios and the mobility requirements to support the scenarios. Models include assessments for air, land, and sea transportation modes; military, civilian, and foreign transportation sources, and various mixes of mobility systems. Each study assumes a level of risk to make mobility capability recommendations. The end result of each study is an evaluation of mobility requirements to support major combat operations and lesser contingencies as well as homeland defense, civil support, and humanitarian assistance missions.

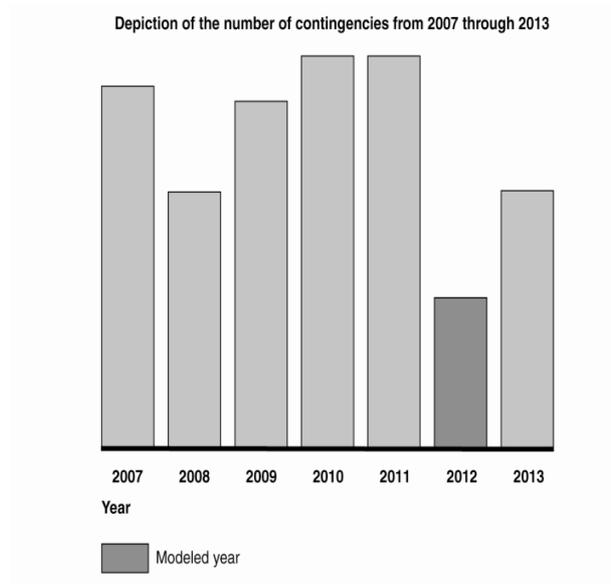
The Mobility Requirements Study (MRS) completed in 1992 sought to resolve issues identified during Operations Desert Shield and Desert Storm by defining post-Cold War strategic mobility requirements. The Mobility Requirements Study Bottom-Up Review Update (MRS BURU) completed in 1995 further refined the requirement for increased strategic mobility. The Mobility Requirements Study – 2005 (MRS-05) completed in 2000 identified mobility requirements based on two nearly simultaneous

regional contingencies but was completed prior the IGPBS which moved forward presence forces back to the U.S.. The latest study is the Mobility Capability Study (MCS) completed in 2005. The MCS report determined strategic mobility requirements based on the 2001 QDR and the 2005 NDS using the 1-4-2-1 force planning construct.

Several evaluations have identified issues in these strategic mobility studies.³³ These reports generally found that the strategic mobility requirements were underestimated for two nearly simultaneous major regional contingencies (MRCs) using forces primarily based in CONUS. To illustrate, in 1995 the MRS BURU report established a requirement of 49.5 million-ton-miles per day (MTM/D) for two MRCs. In 2000, the MRS-05 report established a requirement for 54.5 MTM/D while at the same time the Air Force had a capability of only 44 MTM/D. In 2004, an Air Mobility Command estimate, based on operations in Iraq and Afghanistan, identified a requirement for 60 MTM/D.³⁴ A March 2005 estimate put actual DOD capability at 45 MTM/D resulting in a 15 MTM/D shortfall in airlift capacity.³⁵ This shortfall could even be potentially greater when one considers that most units deploying to Iraq and Afghanistan receive significant amounts of Theater Provided Equipment in lieu of deploying the same unit equipment which reduces transportation requirements into and out of theater.

A General Accounting Office (GAO) review of the December 2005 Mobility Capability Study (MCS) identified issues with the adequacy and completeness of the MCS report.³⁶ The GAO found that the MCS report relied on approaches and methods that had inherent limitations and were not previously used to evaluate mobility capability. The MCS report was to determine requirements for years 2007 through 2013. The GAO found that the MCS report underestimated future mobility requirements to

support major combat operations, homeland defense, and smaller contingencies. The MCS study selected the year (2012) with the least demand as the baseline year for determining mobility requirements. As a result, it did not stress strategic mobility systems to identify shortfalls. Figure 6 shows the GAO estimate and comparison of the yearly mobility requirements used for the MCS study.³⁷



Source: GAO's analysis of MCS notional lesser contingency schedule.

Figure 6 - GAO Evaluation of MCS Hypothetical Contingencies

The GAO also found that the MCS report did not use the same mobility metrics such as million-ton-miles-per-day used in previous DOD mobility studies to measure the ability to meet strategic mobility requirements and objectives. Additionally, the MCS did not measure the impact of increased or decreased strategic lift on achieving warfighting objectives. The GAO evaluation could not determine if the strategic mobility systems and recommendations in the report were adequate since the warfighting objectives and metrics weren't used with mobility metrics. The MCS report itself and the GAO

evaluation of the MCS report both recommend further studies with modeling and assessments of strategic mobility capabilities.

Impact on Pre-positioned Forces

As a result of experience in Operations Desert Shield and Desert Storm, DOD initiated the Bottom-Up Review (BUR) of U.S. strategy to fight two nearly simultaneous major conflicts in North East Asia and the Persian Gulf region. The BUR established strategic mobility requirements for airlift, sealift, and established new land-based and afloat pre-positioned stocks of equipment sets to support rapid deployment of forces to the two theaters. The pre-positioned stocks included unit configured sets for BCTs and other units as well as quantities of supplies. The pre-positioned stocks allowed units to rapidly deploy by air while minimizing airlift requirements since units would draw the pre-positioned equipment upon arrival in theater. Initial plans called for the Army to establish three BCT pre-positioned equipment sets in Kuwait, Qatar, and Korea; one division headquarters set in Qatar; and two theater combat support (CS) and combat service supports (CSS) equipment sets in Guam and Diego Garcia. The Air Force established base equipment sets in Qatar plus ammunition and fuel sets in Diego Garcia. The Marine Corps expanded its previously established three Maritime Pre-positioning Ship (MPS) squadrons to support Marine Expeditionary Brigades.³⁸ Subsequently, MRS BURU completed in 1995 and MRS-05 completed in 2000 further refined requirements for pre-positioned stocks of equipment and supplies based on the global defense postures at the time. Each study included significant forward presence forces overseas to meet its requirements reducing pre-positioned force requirements. The MCS completed in 2005 did not significantly modify requirements for pre-positioned

stocks despite the significant changes in global defense posture which relocated the majority of U.S. Army forces to CONUS.

The current U.S. Army Pre-positioned Stocks Strategy calls for six modular brigade combat team equipment sets established by FY15 to enable the rapid deployment of Soldiers based in CONUS. The six BCT sets consist of four BCT sets positioned on land and two BCT sets afloat.³⁹ The land-based BCT sets include one HBCT in Italy, one HBCT in Korea, one HBCT in Kuwait, and one IBCT in Qatar. The sea-based BCT sets include two IBCTs in Army Strategic Flotillas with one IBCT in Guam and one IBCT in Diego Garcia.⁴⁰ However, military operations in support of Operation Iraqi Freedom and Operation Enduring Freedom have consumed most of existing pre-positioned equipment stocks. As of February 2008, all but one heavy brigade equipment set had been issued for use in support of current operations.⁴¹

Strategic Responsiveness – The Way Ahead

There are multiple methods and options to improve strategic responsiveness of the joint force and to ensure its ability to meet requirements for U.S. strategic objectives and protect U.S. national interests. First, the Department of Defense should lead an interagency strategy review of the Global Defense Posture and its ability to provide strategic responsiveness to support the National Security Strategy. The review should examine and make recommendations on forward presence forces, strategic mobility systems, and pre-positioned stocks of equipment and supplies. These three considerations are interdependent and must be synchronized to achieve the best possible results. The strategy review must determine the strategic responsiveness required and consider all potential adversaries with special attention to the arc of

instability stretching from West Africa across Southwest Asia, South Asia, Southeast Asia, and across the Pacific to the Andes.⁴² The arc of instability represents likely areas for future contingency operations involving U.S. forces. Given the resultant costs, potential risks, and long lead time for changes to take effect, the review should take a long-term view of requirements but also examine near-term and mid-term requirements while establishing interim goals for each.⁴³ The following recommendations should also be implemented. Some recommendations may be implemented quickly while others will need to be phased in due to force commitments in the current fight.

No DOD organization possesses the responsibility to assess changes made over the past four years in defense strategy and operational concepts and to develop a plan for necessary changes to what are, in fact, joint mobility systems to enable achievement of the strategic goals.⁴⁴

Because no DOD entity is currently responsible for assessing impacts of strategy changes, DOD should designate U.S. Joint Forces Command (USJFCOM) as the executive agent for strategic responsiveness. Since USJFCOM already serves as the Global Force Provider to the combatant commanders, this aligns the force provider with the requirement to determine capability to deliver the joint force. USJFCOM should be responsible for the following tasks:

- Defining and assessing the joint force ability to meet the requirements for strategic responsiveness in support of the national strategy.
- Strategic responsiveness modeling and experimentation.
- Assessing impacts on strategic responsiveness of all service strategy, doctrine, and policy changes.

- Determining requirements for forward presence forces, pre-positioned forces, and with the support of U.S. Transportation Command requirements for strategic mobility systems.

Forward Presence Forces Recommendations

Recommendations on forward presence forces should consider stationing forces based on proximity to likely areas of conflict, stationing forces to best protect U.S. national interests, and stationing forces to develop and maintain interoperability with allies. Force stationing decisions should be at locations that best support the U.S. National Security Strategy and not necessarily based on current global force stationing. However, DOD should maintain the current global level of forward presence forces until the new Global Defense Posture Review is complete. Once DOD negotiates and establishes new sites, BCTs should relocate to new main operating bases or forward operating sites in or near the arc of instability.

Until the new sites are established, DOD should retain four BCTs in Europe comprised of one IBCT, one SBCT, and two HBCTs; retain one HBCT in Korea; retain two BCTs in Alaska comprised of one IBCT and one SBCT; and retain two BCTs in Hawaii comprised of one IBCT and one SBCT. European based BCTs have the shortest response time via air to likely areas of conflict in Southwest Asia, South Asia, and Africa requiring only 1/3 to 1/2 the travel time of CONUS based units depending on destination. Alaska and Hawaii based BCTs have the shortest response time via air to Korea requiring just over 1/2 to 2/3 the travel time compared to CONUS units. Table 1 below illustrates the flight times.

APOE	APOD							
	Baghdad IZ (miles)	Flight Time (HRs)	Kabul AF (miles)	Flight Time (HRs)	Mogadishu SO (miles)	Flight Time (HRs)	Osan ROK (miles)	Flight Time (HRs)
Ramstein AB, GE	2174	4.62	3229	6.86	3943	8.37	5478	11.63
Fort Bragg, NC	6468	13.73	7221	15.33	8028	17.04	7271	15.44
Fort Hood, TX	7358	15.62	7836	16.64	9110	19.34	6979	14.82
Fort Lewis, WA	6843	14.53	6768	14.37	8976	19.06	5264	11.18
Fort Richardson, AK	5868	12.46	5480	11.63	7994	16.97	3908	8.30
Fort Shafter, HI	8398	17.83	7508	15.94	10192	21.64	4562	9.69

Flight time based on C-17 average airspeed of 471 mph with 130,000 lb load for a 3200 nm flight, aerial refueling, and great circle routes from APOE to APOD. Assumes land or sea based APS sets are available upon arrival.

Table 2 - Flight Times From Various U.S. APOE To Select APODs⁴⁵

DOD should lead an interagency effort to develop new Main Operating Bases (MOBs), Forward Operating Sites (FOSs) and Cooperative Security Locations (CSLs) with multiple sites in multiple nations in each regional area to counter the unstable political environment in regions of likely conflict. The joint force may be denied use of select FOSs and CSLs just as happened in July 2005 when Uzbekistan evicted U.S. forces from Karshi-Khanabad Airbase⁴⁶ and in February 2009 when Kyrgyzstan's parliament voted to close the U.S. airbase at Manas.⁴⁷ Both bases supported operations in Afghanistan. Regardless of the reason for each country's actions, U.S. forces must expect similar events to occur again based on regional politics and global politics which makes the availability of multiple alternative sites a key consideration.

Strategic Mobility Recommendations

Recommendations for strategic mobility systems must be based on the ability to deploy military forces to likely areas of conflict. Recommendations must include capability for forcible entry and permissive entry operations, capacity at existing air and sea nodes of embarkation and debarkation, and capability to augment or bypass

existing nodes, and capability to overcome area denial and anti-access operations. Both air and sea forcible entry capabilities are critical to enable the joint force's freedom of maneuver by seizing key nodes to allow deployment of the joint force. The joint force must exercise and refine forcible entry capabilities that have lapsed with the lack of available training time due to the high operational tempo of units. Units responsible for conducting forcible entry operations, such as the 82nd Airborne Division and the Marine Expeditionary Brigades, currently have limited proficiency in these operations.

DOD should procure additional C-17s to meet the minimum airlift requirements identified in the MRS-05. The MRS-05 identified a requirement of 54.5 million ton miles per day which is achieved using a combination of C-17 aircraft, C-5 aircraft, and Civilian Reserve Airlift Fleet. In 2002, GEN John Handy then the commander for US Transportation Command, identified a requirement of 222 C-17s to meet the MRS 2005 requirement along with modernization programs for C5 aircraft.⁴⁸ This is an increase of 17 aircraft from the current program objective of 205 aircraft. Estimated total cost of purchasing 17 more C-17s is \$3.57 billion with estimated annual operating cost of \$210 million in 2005 dollars.⁴⁹ Additionally, DOD should promote foreign military sales of C-17 aircraft and commercial cargo sales of C-17 aircraft to maintain the C-17 production line and enhance Civil Reserve Air Fleet capabilities. Table 3 lists current numbers of strategic mobility systems.⁵⁰

Current Strategic Mobility Systems	
Aircraft	Quantity
C-17	205 ^a
C5	128
KC-10	59
Civil Reserve Air Fleet	^b
Cargo Aircraft	100+
Passenger Aircraft	100+
Surge Sealift Ships	
Fast Sealift Ships	8
Large Medium Speed Roll-On/Roll-Off	11
Other Roll-on/Roll-Off	31
Other Ships	27
Afloat Prepositioning Ships	
With USMC Equipment	16
With Army Equipment	10 ^c
With other Sustainment Supplies	9
a. The 205th C-17 will be delivered in 2011.	
b. Quantities vary based on airline participation in CRAF.	
c. Eight LMSRs and two container ships.	

Table 3 - DOD Strategic Mobility Systems

DOD should procure six additional large medium speed roll-on/roll-off ships (LMSRs) to improve strategic sealift capability and increase Army Pre-positioned Stocks afloat by four BCTs which is outlined in paragraphs below. Estimated cost of six LMSRs is \$3 billion. Additionally, DOD should improve the ability to conduct Joint Logistics Over the Shore (JLOTS) operations and at-sea transfer of equipment in rough seas up to Sea State 4 based on the Beaufort scale.⁵¹ JLOTS and at-sea equipment transfer capability is currently at Sea State 2. The capability to execute JLOTS operations and at sea transfer of equipment in Sea State 4 provides 76% to 98% availability dependent on the region. To illustrate, sea state 4 conditions exist from 21% to 44% of the time in three PACOM areas and 40% of the time in one CENTCOM region.⁵² A sea state 4 capability

significantly improves the joint force's freedom of maneuver by reducing potential environment constraints on joint force operations.

Pre-positioned Forces Recommendations

Recommendations for pre-positioned stocks of equipment and supplies must be based on proximity to likely areas of conflict, force protection, and the ability to relocate stocks to employment locations. Pre-positioned stocks should include unit equipment sets and sustainment stocks required to support operations until the routine sustainment stocks begin arriving from CONUS.

DOD must reconstitute Army Pre-positioned Stocks (APS) in APS-2, APS-3, and APS-5 as soon as possible. Current projections reconstitute the APS-2 HBCT no later than FY15, one APS-3 IBCT afloat in Diego Garcia no later than FY10 with one APS-3 IBCT afloat in Guam no later than FY12, and one APS-5 HBCT no later than FY11.⁵³ This results in two IBCT equipment sets afloat in APS-3 stocks with the remaining APS sets based on land.

DOD should increase APS by establishing one HBCT and one SBCT afloat at Diego Garcia and one HBCT and one SBCT afloat at Guam to speed deployment of medium and heavy forces to likely areas of conflict and simultaneously allows available airlift to move other critical assets. This requires a total of six LMSRs with a single SBCT set loaded on one LMSR and a single HBCT set loaded on two LMSRs. This recommendation incurs one-time costs between a minimum of \$3 billion and a maximum of \$10 billion with annual operating costs ranging from \$96 to \$128 million in FY05 dollars depending on the option selected. Table 4 depicts these options. The least expensive \$3 billion dollar option includes purchase of two SBCT equipment sets at

\$1.5 billion each while using existing HBCT equipment sets and six of eleven existing LMSRs in the surge sealift fleet. The most expensive \$10 billion dollar option includes the purchase of two SBCT equipment sets at \$1.5 billion each, purchase of two HBCT equipment sets at \$2 billion each, and the purchase of six new LMSRs at \$500 million each. Annual operating costs, including ship operations and BCT equipment maintenance, are \$128 million which includes \$5 million per BCT equipment set and \$18 million per new LMSR. If existing LMSRs are used, the annual operating costs are \$96 million. The annual operating cost is offset by the current \$42 million cost to maintain the six LMSRs in the surge sealift fleet in reduced operating status.⁵⁴

Estimated Cost of Adding 2 SBCTs & 2 HBCTs to APS Stocks						
(Costs in 2006 Dollars)						
	New SBCT Equipment Sets	New HBCT Equipment Sets	New LMSRs Cost	BCT Annual Maintenance Cost	LMSR Annual Maintenance Cost	Total Cost
Option 1 -						\$10.128 Billion
Buy 2 x SBCT sets	\$3 Billion			\$10 Million		
Buy 2 x HBCT sets		\$4 Billion		\$10 Million		
Buy 6 x LMSRs			\$3 Billion		\$108 Million	
Option 2 -						\$7.086 Billion
Buy 2 x SBCT sets	\$3 Billion			\$10 Million		
Buy 2 x HBCT sets		\$4 Billion		\$10 Million		
Use Existing 6 x LMSRs			\$0 Billion		\$66 Million*	
Option 3 -						\$6.118 Billion
Buy 2 x SBCT sets	\$3 Billion			\$10 Million		
Use Existing HBCT sets		\$0 Billion		\$0 Million**		
Buy 6 x LMSRs			\$3 Billion		\$108 Million	
Option 4 -						\$3.076 Billion
Buy 2 x SBCT sets	\$3 Billion			\$10 Million		
Use Existing HBCT sets		\$0 Billion		\$0 Million**		
Use Existing 6 x LMSRs			\$0 Billion		\$66 Million*	
Cost Basis						
New SBCT Equipment Cost = \$1.5 Billion per BCT				Annual BCT Maintenance Cost = \$5 Million		
New HBCT Equipment Cost = \$2 Billion per BCT				Annual LMSR Maintenance Cost = \$18 Million		
New LMSR Cost = \$500 Million per BCT						
*Annual LMSR Cost offset by \$7 million to maintain in Reduced Operating Status						
**Annual HBCT Cost offset by cost to maintain existing equipment.						

Table 4 - Costs of Adding 2 x SBCT & 2 x HBCT to APS

The increased afloat SBCT and HBCT APS sets combined with the two planned IBCT APS sets provide the joint force the dominant force and decisive maneuver ability for future contingency operations. Afloat APS sets also provide force projection and deterrent capability to the joint force. Afloat APS sets may be moved to locations nearby

responsiveness requirements to support the new National Security Strategy through near-term, mid-term, and long-term time frames. The review should establish the appropriate mix of forward presence forces, strategic mobility, and pre-positioned stocks to support strategic responsiveness through the long-term time frame. Finally, the review should also set near-term and mid-term incremental goals for strategic responsiveness while considering operational risk to meet the goals.

Failure to integrate and synchronize strategy and resources with objectives potentially results in catastrophic consequences in the ability to achieve strategic objectives as well as a high price in blood and treasure. Significant issues and supporting evidence exist to question the synchronization and integration of the current joint force ability to strategically respond to achieve U.S. strategic objectives and protect U.S. national interests. Given its integration in the global economy as well as its commitments in alliances and international treaties, the U.S. must be strategically responsive to pursue and protect U.S. national interests around the globe. The need for a review is critical to ensure that U.S. national interests (ends) are supported and achieved by both the national security strategy (ways) and the joint force (means).

Endnotes

¹ U.S. Joint Chiefs of Staff, *Capstone Concept for Joint Operations Version 3.0* (Washington, D.C.: U.S. Joint Chiefs of Staff, January 15, 2009), 2-3.

² Forward presence forces are those forces permanently stationed overseas. Strategic mobility is the combination of airlift and sealift capability to move forces globally. Prepositioned stocks include equipment configured in unit sets and general supplies located on land or afloat on ship.

³ Alan Vick et al., *The Stryker Brigade Combat Team: Rethinking Strategic Responsiveness and Assessing Deployability Options* (Arlington, VA: RAND, 2002), 82.

⁴ The Long War is the term now used to describe the Global War on Terrorism which includes Operations Enduring Freedom and Iraqi Freedom.

⁵ Sun Tzu, *The Art of War*, trans. Samuel Griffith (Oxford: Oxford University Press, 1963), 96.

⁶ U.S. Joint Chiefs of Staff, *U.S. Department of Defense Dictionary of Military and Associated Terms*, Joint Publication 1-02 (Washington, D.C.: U.S. Joint Chiefs of Staff, October 17, 2008), 523. JP 1-02 defines Strategic Mobility as “the capability to deploy and sustain military forces worldwide in support of the national strategy.”

⁷ *Ibid.*, 214. Joint Publication 1-02 defines Force Projection as “the ability to project the military instrument of national power from the United States or another theater, in response to requirements for military operations.”

⁸ *Ibid.*, 212. Joint Publication 1-02 defines Force Closure as “the point in time when a supported joint force commander determines that sufficient personnel and equipment resources are in the assigned operational area to carry out assigned tasks.”

⁹ For this recommendation near-term goals represent 5-10 years out, mid-term goals represent 10-15 years out, and long-term goals represent 15-20 years out.

¹⁰ U.S. Government Accountability Office, *Future of DOD War Reserves and Prepositioned Equipment and Supplies* (Washington, D.C.: U.S. Government Accountability Office, June 1994), 4. To illustrate during the Cold War prior to the Operation Desert Storm the U.S. Army stated a requirement for thirteen (13) brigade equivalent sets of pre-positioned equipment in Europe under the Pre-positioning of Overseas Material Configured to Unit Sets (POMCUS). The equipment would be issued to units deploying from the United States to Europe allowing rapid reinforcement of NATO forces. The requirement was downgraded to nine (9) brigade equivalent sets when the U.S. military strategy changed from fighting a global war to fighting two major regional conflicts.

¹¹ Robert F. Hale, *Testimony on Proposed Administration Drawdowns of U.S. Military Forces* (Washington, D.C.: Congressional Budget Office, March 19, 1991), 8.

¹² *Ibid.*, 6-8. The U.S. reduced the active Army structure by 29% with over 270,000 personnel reductions. In Europe the army eliminated one armored corps headquarters; two armor/mechanized divisions, two armored cavalry regiments and the corresponding support units. The Air Force reduced structure by 19% with over 160,000 personnel reductions. In Europe the Air Force removed six aircraft wings and closed seven airbases. The Navy experienced a slightly smaller decrease of 13% with 73,000 personnel reductions. The Navy reduced ships from 545 to 451 including one carrier and two carrier air wings. The Marine Corps structure also dropped 13% with personnel reductions of 26,000 including one brigade.

¹³ Donald H. Rumsfeld, *Quadrennial Defense Review Report 2001* (Washington, D.C.: U.S. Department of Defense, September 30, 2001), 14.

¹⁴ *Ibid.*, 17-21.

¹⁵ R. L. Brownlee and GEN Peter Schoomaker, *Army Transformation Roadmap 2004* (Washington, D.C.: U.S. Department of the Army, July 2004), 2-10.

¹⁶ Franklin D. Kramer, "Transformation Abroad: Overseas Basing and Allied Transformation," March 22, 2006, www.ndu.edu/ctnsp/NCW_course/Kramer_6_Mar22.ppt (accessed 14 November, 2008).

¹⁷ Donald H. Rumsfeld, *Quadrennial Defense Review Report 2006* (Washington, D.C.: U.S. Department of Defense, February 6, 2006), 3.

¹⁸ Donald H. Rumsfeld, *National Defense Strategy 2005* (Washington, DC: U.S. Department of Defense, March 2005), 2-3. Traditional challenges are posed by states employing recognized military capabilities and forces. Irregular challenges employ unconventional methods to counter traditional advantages of stronger opponents. Catastrophic challenges involve the acquisition, possession, and use of WMD or WMD like effects. Disruptive challenges use breakthrough technologies to negate stronger opponent advantages. These challenges may be employed singly or simultaneously by adversaries.

¹⁹ Douglas J. Feith, *Strengthening U.S. Global Defense Posture*, Report to Congress (Washington, D.C.: U.S. Department of Defense, September 17, 2004), 4.

²⁰ *Ibid.*, 2.

²¹ Institute for Land Warfare, *Installations as Flagships for Soldier and Family Readiness and Quality of Life* (Arlington, VA: Association of the United States Army, April 2007), 6.

²² Ronald D. Critchlow, *U.S. Military Overseas Basing: New Developments and Oversight Issues for Congress*, CRS Report RL33148 (Washington, D.C.: Library of Congress, Congressional Research Service, August 2005), 3-4. The precise IGPBS numbers of relocating forces, locations, and closing installations are classified. Estimates for force drawdown are 40,000 of 105,570 in Europe, 12,500 of 32,744 in South Korea, and 7,000 of 15,000 in Japan.

²³ Feith, *Strengthening U.S. Global Defense Posture*, 10-11.

²⁴ Overseas Basing Commission, *Report of the Commission of Overseas Military Facility Structure of the United States* (Washington, D.C.: U.S. Government Printing Office, August 2005), 9-10.

²⁵ *Ibid.*, viii.

²⁶ *Ibid.*, C&R2.

²⁷ Congressional Budget Office, *Moving U.S. Forces: Options for Strategic Mobility* (Washington, D.C.: Congressional Budget Office, February 1997), 8.

²⁸ U.S. Department of the Army, *Grow the Army Media Engagement Briefing* (Washington DC: U.S. Department of the Army, December 19, 2007), 5, <http://www.army.mil/growthearmy/> (accessed January 15, 2009).

²⁹ J. Michael Gilmore, *The Army's Future Combat Systems Program* (Washington, D.C.: Congressional Budget Office, April 4, 2006), 11.

³⁰ IBCT requirements vary based on the type of IBCT which may be airborne, air assault, or infantry.

³¹ Table sources include Congressional Budget Office, *Options for Strategic Military Transportation Systems* (Washington, D.C.: Congressional Budget Office, September 2005), 18. Transportation Engineering Agency, *Logistics Handbook for Strategic Mobility Planning, MTMCTEA PAM 700-2* (Newport News, VA: Military Traffic Management Command, Transportation Engineering Agency, September 2002), 3. Transportation Engineering Agency, *Deployment Planning Guide, MTMCTEA PAM 700-5* (Newport News, VA: Military Traffic Management Command, Transportation Engineering Agency, May 2001), 7-11, A1-K6. Ibid., RAND, *The Stryker Brigade Combat Team: Rethinking Strategic Responsiveness and Assessing Deployment Options*, 15-18. Ibid., Congressional Budget Office - J. Michael Gilmore, *The Army's Future Combat Systems Program*, 11.

³² Eric Peltz, John M. Halliday, and Aimee Bower, *Speed and Power – Toward an Expeditionary Army* (Arlington, VA: RAND, 2003), xxii.

³³ These reports include CBO-*Moving U.S. Forces: Options for Strategic Mobility* – February 1997, GAO-*Effects of a U.S. Military Presence in Europe on Mobility Requirements* – November 2001, GAO-*Study Limitations Raises Questions about the Adequacy and Completeness of the Mobility Capability Study and Report* – September 2006, Defense Science Board-*Report of the Defense Science Board Task Force on Mobility* – September 2005, and *Strategic Airlift Modernization: Analysis of C5 Modernization and C17 Airlift Acquisition Issues* – April 2008.

³⁴ John A. Tirpak, "The Airlift Gap," *Air Force Magazine* 87 no. 10, October 2004, p34.

³⁵ Jon D. Klaus, *Strategic Mobility Innovation: Options and Oversight Issues* (Washington, D.C.: Library of Congress, Congressional Research Service, April 29, 2005), CRS-5.

³⁶ U.S. Government Accountability Office, *Study Limitations Raises Questions about the Adequacy and Completeness of the Mobility Capability Study and Report* (Washington, D.C.: U.S. Government Accountability Office, September 2006), 2-14.

³⁷ Ibid., 9.

³⁸ Congressional Budget Office, *Moving U.S. Forces: Options for Strategic Mobility*, XV.

³⁹ U.S. Department of the Army, *Department of the Army Fiscal Year (FY) 2009 Budget Estimates, Operations and Maintenance, Army, Justification Book, Volume 1* (Washington, D.C.: U.S. Department of the Army, February 2008), 196, <http://www.asafm.army.mil/budget/fybm/fy09/oma-v1.pdf> (accessed January 31, 2009).

⁴⁰ U.S. Department of the Army, *Army Campaign Plan 2008 EXORD (U)* (Washington, D.C.: U.S. Department of Army, June 16 2008), 30-31, <https://www.us.army.mil/suite/doc/15155686.pdf> (accessed January 31, 2009).

⁴¹ Kristin French, COL, "Army Sustainment Command – Improving Logistics Support," briefing slides with scripted commentary, Fort Bragg, NC, 406th Army Field Support Brigade, January 16, 2008.

⁴² Overseas Basing Commission, *Report of the Commission of Overseas Military Facility Structure of the United States* (Washington, DC: U.S. Government Printing Office, August 2005), 6-7.

⁴³ For this recommendation near-term goals represent 5-10 years out, mid-term goals represent 10-15 years out, and long-term goals represent 15-20 years out.

⁴⁴ Defense Science Board, *Report of the Defense Science Board Task Force on Mobility* (Washington, D.C.: U.S. Department of Defense, Defense Science Board, September 2005), 19.

⁴⁵ Distances calculated using Distance Calculator at <http://www.infoplease.com/atlas/calculate-distance.html>. Distance based on great circle distance between two locations and does not account for elevation. Flying time is based on airspeed of 471 miles per hour equivalent to the average C-17 airspeed of 409 nautical miles per hour with a 130,000 lb load for a 3200 nm flight leg per Air Force Pamphlet AFPA 10-1403, Air Mobility Planning Factors, dated 18 December 2003.

⁴⁶ Robin Wright and Ann Scott Tyson, "U.S. Evicted from Air Base in Uzbekistan," *Washington Post*, July 30, 2005.

⁴⁷ Leila Saralayeva, "Krygyz Parliament Approves U.S. Base Closure," *Washington Post*, February 19, 2009.

⁴⁸ Harry Levins, "Transportation Command's Chief Emphasizes the Need for More C-17 Cargo Planes," *St. Louis Post-Dispatch*, February 2, 2002, 9.

⁴⁹ Congressional Budget Office, *Options for Strategic Military Transportation Systems* (Washington, D.C.: Congressional Budget Office, September 2005), 41-45. Assumes unit cost of \$210 million per aircraft and annual operating cost of \$12 million per year based on CBO estimates.

⁵⁰ Table constructed from data located in the following two documents. Congressional Budget Office, *Options for Strategic Military Transportation Systems* (Washington, D.C.: Congressional Budget Office, September, 2005), x. Amy Butler, "Boeing Turns to Cost Reduction on C-17 Sales," *Aviation Week* February 13 2009, http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=defense&id=news/C17-021309.xml (accessed February 20, 2009).

⁵¹ Sea State 4 on the Beaufort Scale includes winds of 18-20 knots, moderate waves of 4ft to 8ft taking longer form with many whitecaps and some sea spray.

⁵² Defense Science Board, *Report of the Defense Science Board Task Force on Mobility*, 43.

⁵³ U.S. Department of the Army, *Army Campaign Plan 2008 EXORD (U)*, 30-31.

⁵⁴ Congressional Budget Office, *Options for Strategic Mobility*, 43.

⁵⁵ Eric Peltz, John M. Halliday, and Aimee Bower, *Speed and Power – Toward an Expeditionary Army*, 48.

