

Kuwait to South Asia: The Challenges to Strategic Deployment

**A Monograph
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ABSTRACT

Kuwait to South Asia: the Challenges to Strategic Deployment. MAJ John Scott Nelson, USA, 55 Pages.

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This paper utilizes the Joint Flow and Analysis System for Transportation (JFAST, v.8.0) and a Time Phased Force Deployment Data List (TPFDDL) for a fictional US Army heavy division (-) to run in simulation. This data will add credibility to the issues and validate the recommendations and conclusions. Moreover, this monograph looks at recent deployments and the statistics associated. Both the simulation results and the statistics from recent deployments allow the author to draw conclusions for each facet of the four strategic mobility components in the final chapter. Ultimately, the author concludes that re-deploying a US Army heavy force package inter-theater from Kuwait to India/Pakistan is feasible, but inefficient.

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CHAPTER ONE: INTRODUCTION

The Problem

“...all of these complex systems have somehow acquired the ability to bring order and chaos into a special kind of balance. This balance point – often called the edge of chaos – is where the components of a system never quite lock into place, and yet never quite dissolve into turbulence, either.”¹ – M. Waldrop, *Complexity*

In an age of *globalization* and information super-highways, the ability to dissuade, deter, and potentially defeat threats requires United States (US) policy and capabilities to be more responsive than previous years.² As seen in Operations Iraqi Freedom (OIF) and Enduring Freedom (OEF), policy will not wait anymore for the proper force packages to assemble before an execution order is given; it simply cannot afford to. Although this reality may be frustrating to the conventional war-fighter, it will not go away with time. In spite of everything, Carl von Clausewitz recognized in the early 19th century that, “War... is an act of policy.”³ If anything, this political phenomenon will become ever more characteristic of future operations, as globalization and the democratization of information increases. Information is the undercurrent for this phenomenon. As demonstrated by live reports from the battlefield during OIF and OEF, information is immediate. The fundamental problem is that information technologies are progressing at such a fast rate, due to demand, that the physical infrastructure for supporting the movement of goods and materials is not able to keep pace. Hence, the US Defense Department (DOD) needs military capabilities that are rapidly deployable and employable. This study will use the case of deploying an Army Forces (ARFOR) component of a *Joint Task Force (JTF)* to illustrate the mechanics and challenges faced by US military planners in the current operational environment.⁴ Kashmir and the

¹ M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York, NY: Simon and Schuster, Inc., 1992), 12.

² Thomas Friedman, “National Strategies and Capabilities for a Changing World: Globalization and National Security,” luncheon address (<http://www.fletcherconference.com/army2000/new.htm>), 2000 Fletcher Conference, Arlington, VA, 15 November 2000, 2.

³ Carl von Clausewitz, *On War*, ed. and trans. by Michael Howard and Peter Paret (Princeton NJ: Princeton University Press, 1984), 87.

⁴ JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 05 June 2003, 290.

friction between India and Pakistan will provide the vehicle for examination to determine the feasibility of an inter-theater deployment of forces. The fundamental question this study researches is: is it feasible to re-deploy a US Army heavy force package from Kuwait to India/Pakistan for a stability operation? I will discuss the variables that affect a strategic deployment of this nature, and then put it to simulation in order to draw some conclusions. Given the current operational environment, the hypothesis is that it is *feasible* to re-deploy a US Army heavy force package in an on-going stability operation from Kuwait to India/Pakistan for another stability operation.⁵

The force structure of the US Army today is largely a result of the US policy and strategy for defending a world against the Soviet proliferation of communism. From the combat service support structure in the corps to the divisions, the design centered on a potential invasion of Western Europe, or in the case of light divisions, potential communist incursions into places such as sub-Saharan Africa, Central America, or Southeast Asia. In the case of Western Europe, strategic mobility was less important, because we knew where the ‘fight’ was going to occur. As a result, division and corps designs were robust organizations designed to support themselves with the assumption of disrupted strategic lines of communication.⁶ Due to this, Prepositioned of Material Configured in Unit Sets (POMCUS) existed in Europe to facilitate this strategy.⁷ This system differs from the ‘Plug and Play’ force design that DOD desires to prepare for an unpredictable strategic environment. The goal is a military with rapidly deployable, and expeditionary units that are designed for non-contiguous warfare, with preemption, not deterrence, as the foreign policy.⁸

⁵ Ibid, 194.

⁶ Eric Peltz and John Halliday. “Making the Power Projection Army a Reality,” *The US Army and the New National Security Strategy*, Chapter 11 (Santa Monica, CA: RAND Publishing, 2003), 242.

⁷ Mark A. Bellini, *Is Getting There Half the Battle? Considerations for Deployment of Forces* (FT Leavenworth KS: SAMS/CGSC Printing, 1992), 3.

⁸ General Peter Pace, VCJCS, *An Evolving Joint Perspective: US Joint Warfare and Crisis Resolution In the 21st Century* (Washington D.C.: JCS, Directorate of Management Printing Office, 2003), 5.

Strategic mobility is, “the capability to deploy and sustain military forces worldwide in support of national strategy.”⁹ Therefore, this paper uses four components of Strategic Mobility to determine the feasibility of deploying forces to South Asia: Airlift, Sealift, Army Prepositioned equipment sets Afloat (APS-A), and Infrastructure.¹⁰ Joint Publication (JP) 3.0 defines the characteristics of the *operational level of war* as being capable of linking operational with strategic objectives through the application of resources to bring about and sustain operations.¹¹ It is in this spirit that it is necessary to assess the feasibility of conducting a deployment to South Asia through the lens of *Strategic Mobility*.

Background and Purpose

In order to provide a direction and focus for adapting land forces to be more agile and expeditionary in structure and culture, General (Ret.) Eric Shinseki formally articulated the vision for Army transformation in 2000.¹² Small footprints of sustainment and rapid deployability are hallmarks for ultimately maintaining the relevance of the army in the *contemporary operational environment* (COE).¹³ President George W. Bush stated that, “We build a world of justice, or we will live in a world of coercion. The magnitude of our shared responsibilities makes our disagreements look so small.”¹⁴ The implication of this statement on the military is enormous and requires an honest assessment and thorough study as to the relevance of every aspect of doctrine and force structure. Preemption requires that the Department of Defense (DOD) must have military forces ready to deploy at a moments notice.

US force projection capability is a tangible instrument of military and national power which can effectively facilitate our ability to “deter and dissuade” a war in South Asia. However, with the current force structure, the mechanics of strategy are challenging. Compounding the complexities of deploying

⁹ JP 1-02, 506.

¹⁰ Ibid.

¹¹ Ibid, 387.

¹² Louis Caldera and Eric Shinseki, “Army Vision,” *Military Review*, September – October 2000, 3.

¹³ Douglas MacGregor, *Breaking the Phalanx: A New Design for Landpower in the 21st Century*, Center of Strategic and International Studies (Westport, CT: Praeger Publishers, 1997), 230-231.

¹⁴ Bush, NSS, 9.

the current force structure, initially designed for mobilization and deployment in support of Cold War scenarios, is the attempt to transform while executing the Global War on Terror and honoring past commitments (i.e. The Balkans and Korea). Therefore, the US military's ability to operate effectively and continuously, with its reliance on strategic lines of communication, is diminishing.¹⁵ Military transformation is about changing the methods of employing forces and their structures. Moreover, without effective change, the continued demands of the national leadership will further challenge the military's ability to provide adequate capability to support US policy.

Contemporary Joint War-fighting, in an information age, requires that joint force commanders gain and retain the initiative in crises.¹⁶ With instant communications, a crisis can develop at a moment's notice, as demonstrated by OIF and OEF. As it affects the military, strategic problems and decision-cycles manifest themselves, and run their courses before any force structure is available to act. Although the pace of information has put an emphasis on rapid response and flexibility, the phenomenon is not new.

The United States has a brief, but rich, history in the business of force projection, starting in the 19th century through the Spanish-American War, from World War I and World War II, into the Cold War, and now in the Global War on Terror. From the time of the Cuban Missile Crisis, 'flexible response options' was a strategy used as a means for safeguarding US interests in the Cold War.¹⁷ However, in the 1970's and with a renewed emphasis on defending against the Soviet threat in Western Europe, the need for worldwide capable, rapidly deployable forces, with their equipment, diminished.¹⁸ This was evident in the flaws of Operations Eagle Claw (Iran 1979) and Urgent Fury (Grenada 1983). Moreover, in 1979, President Carter's Secretary of Defense, Harold Brown, recognized that "...we must have sufficient

¹⁵ MacGregor, 230-231.

¹⁶ Pace, 47.

¹⁷ Paul Tiberi and James C. Wendt, *Gathering the Storm: Contingency Planning and Force Projection* (Arlington Virginia: The Institute of Land Warfare, 1991), 2.

¹⁸ Ibid, 2.

capabilities to permit the rapid movement of substantial forces to threatened theaters.”¹⁹ Thus began the emphasis on creating force structures that were capable of deployment in support of contingencies; although, most of the emphasis for building this force capability was centered on amending the Unified Command Plan (UCP) for building command and control structures and re-defining service component responsibilities (i.e. Goldwater-Nichols Act). Furthermore, the largest portion of the Army affected by this contingency emphasis were the airborne, light, and special operations forces, as they were easily transportable, not burdened by the sheer weight of their equipment, and force structured for the types of foreseen contingencies of that era (i.e. Angola, Central America, etc...). The US Army’s heavy forces still primarily focused on conventional warfighting in Europe and Korea. Then in 1990, Iraq invaded Kuwait, requiring the use of heavy forces as a part of the *Flexible Deterrent Option* in support of national goals and objectives.²⁰

According to Joint Publication 1-02, a *Flexible Deterrent Option* is, “...the means by which the various deterrent options available to a commander (such as economic, diplomatic, political, and military measures) are implemented into the planning process.”²¹ Desert Storm highlighted the need for heavy forces to be capable of rapid deployment. Concerning Desert Storm and policy, some authors have concluded that the “ambiguity” of a crisis requires that all options be available for use.²² Therefore, the necessity of having the US Army heavy option readily available is paramount. In the case of the Persian Gulf War of 1991, heavy forces were one of the critical components for deterring the Iraqis from crossing the border into Saudi Arabia.²³ It took nearly three months, a call up of the Civil Reserve Air Fleet (CRAF) stage two, and the mobilization of the reserves to assemble a force of four divisions for Desert Storm.²⁴ Although an extraordinary feat in its day, the lesson was that heavy forces are critical to US national security interests and the force posture/construct with the new strategic environment was

¹⁹ Ibid, 3.

²⁰ JP 1-02, 203.

²¹ Ibid, 203.

²² Tiberi, 18.

²³ Ibid, 18.

²⁴ Ibid, 20.

disparate. Contrast Desert Storm with Operation Iraqi Freedom, where the US 3rd Infantry Division (-) deployed limited amounts of rolling stock from their home-station in Georgia, drew the Army Prepositioned Set (APS)-5 Kuwait and Qatar, along with a brigade set of equipment afloat (APS-3), and were combat ready in two and a half months.²⁵ Contrary to four divisions and two US corps employed in Desert Storm, the 3d ID, plus two additional brigades from the 82d and 101st Airborne divisions and two additional battalions from Ft Riley Kansas, was the only heavy US army division to actually participate in invading Iraq to depose the regime.²⁶

The target audience for this monograph is the operational planner. The purpose of this monograph is to demonstrate and discuss the complexities in the mechanics of strategic deployment. Furthermore, it is logical to determine the feasibility of deploying a US Army heavy force package to Kashmir against the construct of contemporary operations and the strategic mobility system. The concept is to research a potential military contingency (i.e. Kashmir), then run its data in simulation, and examine recent operations to draw conclusions and make recommendations. Lastly, the scenario in Kashmir is a vehicle for discussing some critical contemporary issues facing the US strategic mobility system.

Scope and Limitations

The scope of this subject is potentially very broad. This study uses the scenario of a crisis in Kashmir to highlight the challenges and mechanics of planning US strategic deployments. Furthermore, this study discusses the challenges and issues currently facing the strategic mobility system, as it relates to current operations and needs. This study did not compare strategic courses of action to determine cost effectiveness. An underlying assumption in the simulation is that the decision to commit US forces is final. It focuses on the issues surrounding the third phase of the joint deployment process, which involves

²⁵ COL James L. Hodge, 3d Infantry Division Logistics After Action Review Briefing (FT Stewart GA: 3d INF DIV).

²⁶ The 2 battalions from FT Riley were from the 1st Armored Division = 1-41 INF & 2-70 AR.

USTRANSCOM: the strategic ‘port to port’ movement of forces.²⁷ A computer model simulation will validate feasibility through data, but cannot fully address, or replicate, all of the assumptions and issues within the scope of this monograph.

This study recognizes some additional criteria that bear an equal amount of research in determining feasibility: sustainment and command/control. Although feasibility can be determined from a criterion of command and control, it is necessary to limit the focus to facilitate depth of research. Command and control, as it relates to the Unified Command Plan warrants an in-depth analysis with solid recommendations and issues, as it is critical for determining the feasibility of future operations. Additionally, sustainment demands the same amount of research and analysis for determining feasibility. However, for this monograph, the only focus is on the strategic mobility aspect. The reader must understand that full feasibility cannot and must not be determined on mobility alone. The ability to design a command and control structure and sustain a force is equally important criteria for determining the feasibility.

The intent of the monograph is to present the contemporary issues surrounding strategic mobility with a simulation to validate the hypothesis presented. Sources were not limited and information was sought in doctrine, theory, military and civilian sectors, and through discussing these issues with subject matter experts. Furthermore, the paper is not limited to defining terms in the strict sense of using either FM 1-02 or JP 1-02; rather, for definitions not easily defined in military publications, *The New College Edition American Heritage Dictionary* was used.

Importance

This case study is important because our ability to put credible forces on the ground early will allow us to retain strategic initiative. Credible is defined as, “Worthy of confidence; reliable.”²⁸ As

²⁷ JP 4-01.8, *Joint Tactics, Techniques, and Procedures for Joint Reception, Staging, Onward Movement, and Integration*, 13 June 2000, I-3.

articulated in an August 2003 article, light armored vehicle variants, like the Stryker, may not always be suitable for the spectrum of contingency operations requiring a timely response.²⁹ As commented on, reference Desert Storm, “The early insertion of military force tends to paralyze the enemy’s initiative while restricting or narrowing his options. However, applying the wrong force... can lead to military defeat and subsequent political disaster.”³⁰ Moreover, in the world today, who can predict the types of force sets we are to face? Certainly a credible force for deterring the Indians from invading Pakistan’s Punjab region would require a significant armored force (especially if US neutrality/legitimacy is compromised).

The US military needs a full spectrum menu of flexible deterrent options that are rapidly deployable. Light armored vehicle systems, vulnerable to threat armor or anti-armor rockets, may not always be the solution. To err on the side of rapid deployability by reducing armored survivability is to put the mission at risk, along with the personnel executing the mission. The focus on the strategic mobility system will demonstrate that there are ways to deploy the full-spectrum of forces, but there are significant issues associated with its components. Specifically, the contemporary operational environment awkwardly affects two strategic mobility components: airlift and sealift. Both endure periods of under-use, then experience periods of extreme surge and crisis. Additionally, recent events have severely depleted our prepositioned stockages. The following chapters will examine how each strategic mobility component affects the deployment of US forces from Kuwait to India/Pakistan inside the spectrum of 120 hours to 40 days.

²⁸ William Morris, ed., *The American Heritage Dictionary of the English Language* (Boston MA: Houghton-Mifflin Co, 1980), 311.

²⁹ William S. Lind, “How NOT to Use Light Armored Vehicles,” *Military.com*, 13 August 2003, n.p., Internet, online, 13 AUG 2003, available from http://www.military.com/NewContent?file=Lind_081303&ESRC=dod.nl.

³⁰ Tiberi, 19.

Organization

This monograph has four chapters. Chapter one introduces the subject by stating the research question in the opening paragraph. It further defines the problem and gives a background discussion on US force projection. Moreover, it highlights the importance of the study and defines the scope and limitations. Chapter two outlines the parameters for simulation in the deployment time window used and force structure deployed, and also explains why the South Asian scenario with a heavy force is important. Chapter three discusses strategic mobility to develop the components of feasibility in terms of Airlift, Sealift, APS-A, and Infrastructure. I also discuss the challenges of contemporary, and future, operations to US Transportation Command (USTRANSCOM). Chapter Four will state recommendations and conclusions as they affect each previously discussed topic and component.

I decided to use the Joint Flow and Analysis System for Transportation (JFAST) computer simulation model, version 8.0 to validate some of the discussion and statistics cited. The simulation replicated the mechanics of moving a division headquarters, associated echelons above division/corps support assets, and two brigade combat teams into India/Pakistan from Kuwait. A Time Phased Force Deployment Data List (TPFDDL) was developed in JFAST and ran in the deployment generator to develop statistics for further analysis of related discussion points. Outside agency support was solicited from the War Plans Division at USTRANSCOM to validate the TPFDDL (B8 file) used in JFAST for reliability of research.³¹ This data will stand-alone and allow the reader to draw conclusions as they relate to the components for determining feasibility.

CHAPTER TWO: THE SIMULATION

The Joint Flow and Analysis System for Transportation (JFAST) computer simulation model, version 8.0, is a simulation software program designed to provide the operational planner with a tool for

³¹ Lt.Col. William “Brent” Spahn, Chief, USTRANSCOM War Plans Division (Scott AFB Illinois), and Mr. Phillip Boyer, JFAST Contract representative at USTRANSCOM, 03 DEC 2003.

measuring the effectiveness of a deployment plan. It achieves this by allowing a planner to input a TPFDDL (B8 File) and, then, run the associated data against databases for air, sea, and infrastructure. It also provides a geographic reference capability for simulating the actual movement of these transportation enablers, with their cargos, in time and space. This simulation tool allows a planner to create or import a TPFDD, enter the desired time parameters, enter the mode/source of transportation enablers, design an air/sea fleet, and then conduct an actual deployment generation to gain an appreciation of critical areas of concern associated with a deployment plan. This chapter will explain the use of a deployment scenario to South Asia, and define the time window and force structure utilized in simulation.

The South Asian Scenario

Developing a relevant and challenging scenario is essential to the usefulness of the simulation and testing the stated hypothesis. This scenario was selected because of the challenges of deploying the sheer volume and weight of a US Army heavy force package and overcoming the distances from the Continental United States (CONUS) and Kuwait to South Asia (India/Pakistan). Recognize that the divisional forces used in the simulation originate in Kuwait, but most of the strategic transportation enablers for moving those forces are based in CONUS as assets under US Transportation Command (USTRANSCOM); hence, one of the challenges is being able to move enablers to the force in a timely manner. Furthermore, this scenario allows a full use of all four of the components for determining feasibility. Additionally, South Asia provides a solid representation of the type of operational environment and contemporary challenges envisioned by Department of Defense planners. Lastly, Pakistan and India are about the farthest distance in which Sealift, Airlift, and APS-A would reasonably be required to operate given the contemporary operational environment.

The Deployment Time Window

In order to accomplish an effective deployment in simulation, time parameters, or benchmarks, must be established; otherwise, there is no measure of effectiveness from which to determine usefulness.

This monograph used benchmarks from General Shinseki's vision of transformation to determine a measure of effectiveness at the 'low end' of the time spectrum for deployability. Additionally, on the 'high end' of the time spectrum, this simulation took from the 1993 Bottom-Up Review Mobility Requirements Study benchmarks for deploying divisions and corps. Today's strategic environment is uncertain and fluid; therefore, our ability to deploy credible forces is paramount to executing effective foreign policy. In order to determine feasibility, it is imperative to discuss the contemporary issues facing the strategic mobility and defense transportation system. It is through this transportation infrastructure that the US military deploys and is sustained (on a strategic level).

General (Ret.) Eric Shinseki, formalized the 'low-end' benchmark in 1999 stating that we should aim for being capable of deploying a brigade, to anywhere in the world, within 96 hours of lift-off. Divisions would follow within 120 hours, with five divisions being capable within 30 days.³² He placed an ideal benchmark at the forefront of the time spectrum for conducting strategic deployments as they relate to brigades and divisions. Unfortunately, when put to simulation, these times are just not reasonable when contrasted in the context of current technologies and today's capabilities.³³ Therefore, this study refers to these aforementioned benchmarks more in terms of a start point, rather than hard realities.³⁴

On the 'high-end' of the time spectrum for simulation, the 1993 Army Strategic Mobility Program Objectives provides benchmarks based on older assumptions of the operational environment. However, the delivery times and the size units associated with the delivery are more reflective of the

³² Caldera and Shinseki, 4. The author realizes that this statement is ambiguous and bears further study/research as it stands by itself. For instance, does he mean the whole BCT/SBCT on the ground capable of operations within 96 hours of the first aircraft lifting off from the APOD, or does he mean 96 hours from lift-off being the first aircraft landing in the operational area. Either way, the author just wants to demonstrate the understanding of ambiguity and utilize the goal as a mere starting point on a potentially infinite time spectrum. The reader will see that, in simulation and under the author's assumptions, these time goals are not attainable.

³³ Jonathon B. Brockman, *The Deployability of the IBCT in 96 Hours: Fact or Myth?* (Ft Leavenworth KS: CGSC Printing Office, 2002), 38.

³⁴ John Gordon and David Orletsky, "Moving Rapidly to the Fight," in *The US Army and the New National Security Strategy*, eds. Lynn E. Davis and Jeremy Shapiro (Santa Monica, CA: RAND, 2003), 193.

current force structures, than that of the transformation vision benchmarks. It states that a full US Corps, with five divisions and one Corps Support Command, must be on the ground and operational by 75 days after initiation of the deployment of forces (or C-Day).³⁵ This determination was a result of the September 1993 Bottom Up Review (BUR-93) and was based on the assumption of a two Major Theater of War engagement.³⁶ This assumption, bear in mind, was based on two relatively mature theaters of war. Mature is defined as having the port capacities for personnel and life support, hazardous materials, Petroleum (POL), and cargo with a throughput capacity equal (within 15%) to that of the points of embarkation. For use in simulation, a divisional deployment, at the high-end of the time spectrum, is defined as 1/3 that of 75 days (25 days), plus an additional 15 days for the closure of corps support assets; hence, 40 days. Therefore, the deployment time window for measured success in simulation is four to forty days.

The Force Structure

The military has used research and development over the past ten years to enhance our kinetic capabilities in war-fighting, but what it lacks is the technology in mobility and sustainment.³⁷ US force structures are vestiges of the Cold War; with support structures designed for corps and division operations in places such as Europe or Korea. In the past ten years, contingency deployments have forced these archaic systems to morph into more deployable entities based on the operational environment. For instance, now more than ever before, divisions and brigades are serving as JTF and ARFOR headquarters, requiring echelons above division and corps units (EAD/EAC), designed originally to support US armies and corps, to deploy in direct support. This phenomenon occurs because divisions do not have the

³⁵ Victor L. Nelson, *Power Projection of an Army Corps by C+75: On Target or Wishful Thinking?* (FT Leavenworth KS: CGSC Printing Office, 1998), 5.

³⁶ Ibid.

³⁷ BG Huba Wass De Cege, *"New Paradigm" Tactics: A Primer on the Transformation of Landpower*, DARPA (Washington DC: DARPA, 2003), 23.

organic capability to fulfill the heavy support laden requirements of such contingency operations, whether it is peace enforcement in Bosnia or counter-insurgency operations in Iraq (see Figure 1).³⁸

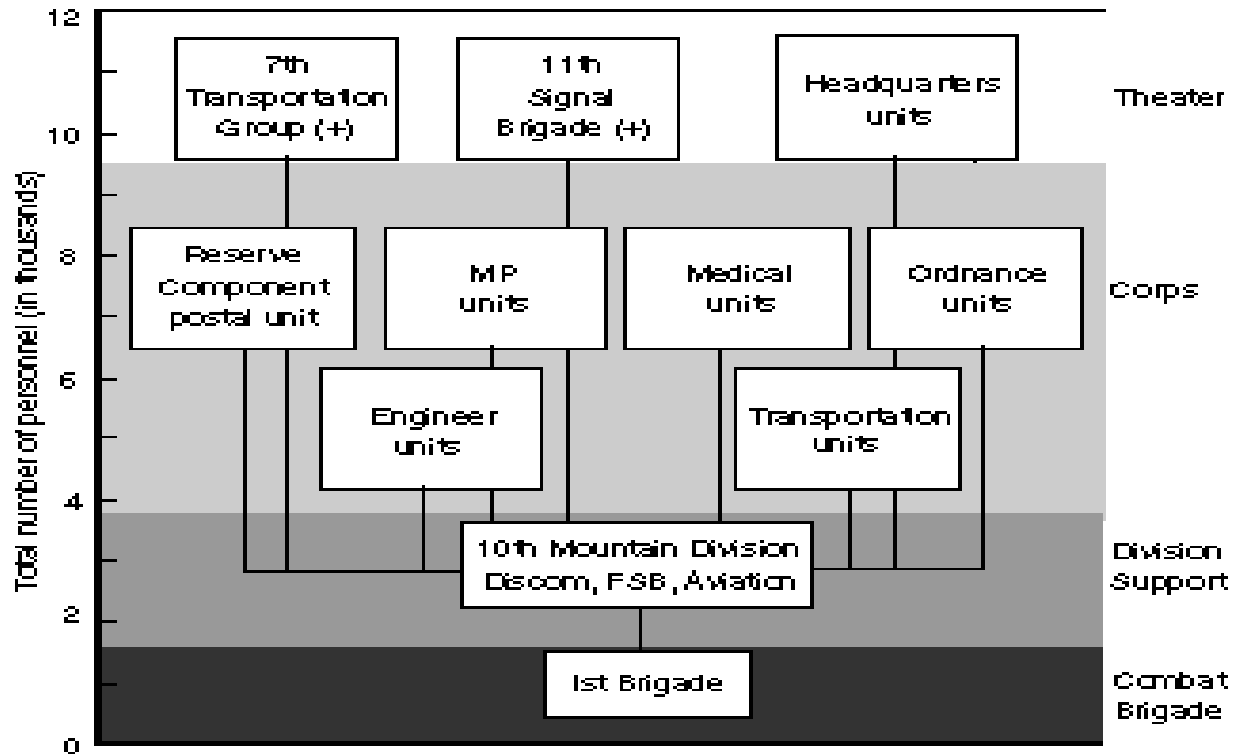


Figure 1 (ARFOR Composition for Operation Restore Hope, 1993)³⁹

In order to execute an effective strategic deployment, the force structure must be packaged for timely movement and prepared to conduct reception, staging, onward movement, and integration. Recent ad-hoc force structures, such as in figure 1, juxtaposed against the strategic environment presents a significant problem: getting there in the simulation time window previously defined. As stated in Chapter one, our current army force structure was developed on the assumption of little reliance on critical strategic lines of communication (LOCs).⁴⁰ The South Asian scenario illustrates the fact that a relatively immature theater of operations presents a significant challenge to the assumptions of Cold War

³⁸ Thomas McNaugher, David Johnson, and Jerry Sollinger, "Agility by a Different Measure: Creating a More Flexible US Army," *RAND Issue Paper-195*, 2000.

³⁹ McNaugher, Johnson, and Sollinger.

⁴⁰ Peltz and Halliday, 242.

deployment and sustainment doctrine. Referring to deployment operations in Afghanistan may not accurately represent all of the potential complexities of deployment. The situation in Afghanistan does not warrant the type of heavy deterrent that a potential war over Kashmir would. It is logical that predominantly light and airborne forces have executed the JTF missions and force structures for OEF - Afghanistan. First, it is a land locked country which begs an air centric strategic LOC. Secondly, the threat environment does not warrant the heavy use of armor or mechanized infantry. This is not the case with India and Pakistan.

Both countries are accessible from the sea. Under assumption for this simulation, the US force was invited to the region, by both India and Pakistan, as the recognized impartial arbitrator. Therefore, no forced entry capability was necessary to facilitate the insertion of US forces. Aside from the potential threat of nuclear exchange and terrorism, Indian and Pakistani conventional forces threaten each other with mechanized and armored forces. This maneuver warfare scenario is militarily reminiscent of 1980's Cold War Europe. Additionally, the entering of a US force would have to rely heavily on its strategic LOCs, as South Asia provides only limited host-nation support capability. Lastly, due to our strategic need to be perceived as an impartial authority, an equally credible military force must be deployed symmetrically on either side of the Line of Control that divides Jammu-Kashmir (India) from Azhad-Kashmir (Pakistan).

As Kashmir straddles the boundary between the US Central Command (CENTCOM) and the US Pacific Command (PACOM) areas of responsibility, designation of the JTF command and control (C2) structure is critical to alleviating confusion. For the simulation, the "Joint Task Force (JTF)-Kashmir" was under the C2 of USPACOM, with USCENTCOM in a supporting role. Additionally, USPACOM designated Naval Forces Pacific (NAVFOR) for the JTF core headquarters as it has the capability to control the JTF from a C2 vessel afloat off the South Asian coast. Due to geography, Air Forces (AFFOR) will apportion from USCENTCOM to support operations in India/Pakistan. However, the predominance of air capabilities will emanate from a carrier battle group off the coast, as there is little

need for robust US Air Forces to locate themselves in India or Pakistan. The Joint Forces Air Component Command (JFACC), therefore, will remain afloat with the JTF headquarters.

Accordingly, it was determined that the ARFOR component of JTF-Kashmir would be structured with armor and mechanized capabilities to provide a credible deterrent against the corresponding Indian and Pakistani conventional capability. India retains the more capable and robust conventional military strength in the region, which has been battle-proven three times in recent history.⁴¹ Furthermore, Pakistan relies heavily on its nuclear deterrent to prevent another Indian victory. Therefore, the ARFOR must have capabilities for countering either side's strengths. For the simulation, the ARFOR deploys symmetrically to retain the perception of impartiality, but with varying capabilities on either side. As a result, the ARFOR has a preponderance of forces on land and, therefore, be designated the Joint Forces Land Component Command (JFLCC). The overall structure for the ARFOR is comprised of the division headquarters, EAC and EAD units for appropriate support, the division aviation brigade (with two AH64 battalions and a CH47 lift company), and two brigade combat teams (one brigade is armor heavy, 2x1; one brigade mechanized infantry heavy, 1x2).

Specifically, EAD and EAC units consist of two water purification teams, a combat support hospital with associated support (i.e. veterinarian services, preventative medicine, entomology, and logistics support unit), a postal detachment, two construction engineer (CSE) companies, UH1 air ambulance support, and the transportation support infrastructure to enable strategic movement into theater. Furthermore, given the amount of severely restrictive terrain associated with the Kashmiri border, the brigade combat teams deployed with all associated assets (including organic artillery battalions). The division did not bring any general support artillery, but did bring the target acquisition capability (Q36 radar). Additionally, the division military intelligence battalion was deployed to support intelligence collection activities. Lastly, due to the nuclear capabilities of both sides, a US Patriot missile battalion was deployed into Pakistan. This capability will be able to neutralize the opposing

⁴¹ SAMS Issue, *India Battle Book* (Ft Leavenworth: CGSC Printing Press, 2002).

Indian/Pakistani nuclear delivery capabilities through demonstrated performance in previous operations (both sides have ballistic missile and aircraft delivery systems for their nuclear weapons).

In the scenario for simulation, the armor heavy battalion was positioned in the southern portion of the Kashmiri border (Punjab region of Pakistan), where the terrain is more flat and less restrictive. Historically, the Indians have used their armor/mechanized capability in this region (Northern Punjab) to counter Pakistani heavy forces. Furthermore, the infantry heavy portion of the US ARFOR was positioned in the more restrictive terrain along key mountainous portions of the Line of Control. In the spirit of impartiality, the simulation used Islamabad Pakistan (Chaklala Air Base) and Srinagar India (the airfield) as the centers for the ARFOR headquarters and basing. This force lay-down roughly corresponds with the current United Nations Mission Observer Group for India and Pakistan (UNMOGIP; See Appendix B).

Structurally, the ARFOR splits its C2 by two elements (Srinagar and Chaklala) and positions its assistant division commanders in charge of each side, with the JFLCC commander able to roam freely between the two elements. Inevitably, the role of these flag officers was envisioned as operational to strategic, not as tactical. As a result, this very important, yet burdensome, operational role is taken off the shoulders of the subordinate brigade commanders to allow them to focus on the extremely volatile tactical situation. Furthermore, the aviation brigade headquarters, one AH64 battalion, and the CH47 Company are located in Pakistan due to altitude and weather considerations. The second AH64 battalion locates itself in Srinagar to provide an aerial fire support capability to the infantry heavy brigade combat team operating on the Indian side in the mountains. Finally, the construction engineers (CSE) consist of two companies, one on either side, and provide a dual role. First, their use solidifies our commitment to the region by improving the road systems and civil infrastructure on both sides of the border (information operation to develop US credibility). Secondly, the CSE capability improves the ARFOR's mobility and, thus, ensures adequate readiness to respond to threats.

The entry of the JFLCC forces into theater is logically based on the need for immediate combat capability and transportation enablers to facilitate follow-on forces flowing from Kuwait into Joint Operations Area (JOA) - Kashmir. A host of transportation support enablers flow into the Aerial Ports of Debarkation (APODs) to provide reception capability. Two transportation terminal service companies from a port opening support battalion flow into the APODs at Bombay, India and Masroor, Pakistan to set up port support activities at the designated Sea Ports of Debarkation (SPODs) of Nhava Sheva, India and Karachi, Pakistan.⁴² This initial flow takes place on C+1 through C+3 (day) with the assistance of contracted and military air. The simulation uses two Sea Ports of Embarkation (SPOEs) in Kuwait: Ash Shuaybah and Ash Shuwaykh. Additionally, one strategic Aerial Port of Embarkation (APOE) is utilized: Kuwait International. The infrastructures and capabilities of each will be discussed in further detail later in the paper.

Within the context of the simulation's scenario, this ARFOR is difficult and inefficient to deploy, even if there is a notable increase in the sea and air fleets capabilities. This is not necessarily due to the dimensional or weight characteristics of the equipment, or even due to the structure of the combat units. Rather, infrastructure in the Joint Operational Area (JOA) will hamper the closure of any force, regardless of amount of aircraft or sealift.⁴³ Additionally, the strategic mobility system is not responsive by design. Strategic airlifters are limited and centrally controlled by Air Mobility Command (AMC) and USTRANSCOM, the Military Sealift Command (MSC) assets are not always readily available for immediate onload and transport of forces, and there are very limited prepositioned assets available for use.⁴⁴ However, the global environment is not waiting for the US military to 'catch up' with its transformation processes. Commercial demands are maturing the world of global connectivity faster

⁴² FM 55-60, "Chapter 2 - Marine Terminal Units," *Army Terminal Operations* (Washington DC: Defense Printing Agency, 1996), 2-1.

⁴³ Gordon, 192.

⁴⁴ Stanley Associates, Inc., "The Automated Battlebook System 2003-3," *ABS2003-3*, CD ROM, US DOD, 2003.

today than ever, leading to significant technological advances in the area of movement.⁴⁵ In the case of Kashmir, not only does existing POD infrastructure present significant issues (especially with hazardous materials, such as ammunition and POL), but also the fact that the US will not always get the necessary access to existing facilities. This is primarily due to the host nation's economic needs and sensitivities. Furthermore, the position of deploying forces (Kuwait) does not facilitate a rapid link-up of strategic transportation assets due to proximity of assets at the time of need.

The following chapter will describe the challenges associated with four primary components of the strategic mobility system. Additionally, research into recent operations will demonstrate the issues associated with each component. Lastly, each component was exercised in simulation to validate some of the research conducted from recent operations. This data will illustrate the challenges faced in the simulation and lend more credibility to the documented issues and challenges faced in the 'real-world.'

CHAPTER THREE: THE COMPONENTS OF STRATEGIC MOBILITY

Airlift

*"Complete mobility can be reached only through control of the air and free movement through the air to the objective. To attain that mobility we must do more than pay lip service to being air transportable."*⁴⁶ — CPT M.J. Berenzweig, *Infantry Journal* 1950.

Airlift is the most rapid and flexible strategic mode of cargo and personnel delivery in today's military inventory, but it is the most costly and has limited capacity.⁴⁷ For the past ten years, the United States military has been building its systems around air deployability. For instance, the Stryker Brigade Combat Teams (SBCT) and Army transformation centers around the assumption of rapid deployability based on air. However immediate the results, there are significant drawbacks to use of airlift. First, the

⁴⁵ Wass De Cege, 25.

⁴⁶ Quoted in Scott F. Smith, *Boots in the Air: Moving the New Army Brigade* (Maxwell AFB, AL: SAAS, 2000), 45.

⁴⁷ MTMC-TEA Pamphlet 700-2, "Logistics Handbook for Strategic Mobility Planning," September 2002, 11.

physics of flight precludes mass deliveries of outsized equipment. For instance, one C17 Globemaster can airlift only one M1A1 Main Battle Tank (70 STONS), as its maximum cargo payload is about 85 short tons (STONS).⁴⁸ Furthermore, while the C17 aircraft does not require a transshipment point (based on its Short Take-off/Landing capability; STOL), the C5 Galaxy aircraft is more fuel-efficient and can carry payloads for longer distances (See Figure 2).⁴⁹ Second, there has been a significant decline in airframes available in the past ten years, resulting in a diminished capacity to haul.⁵⁰ Third, the number of flying hours, until OEF and OIF, was reduced significantly from a decade before due to the complexity of the post-Cold War decade (e.g. commercial contracting of cargo/passenger hauls or the reduction in forward basing of units).⁵¹ Fourth, lack of adequate Material Handling Equipment (MHE) has made throughput times on the receiving end a challenge (this will be discussed in the ‘Infrastructure’ section of this paper).

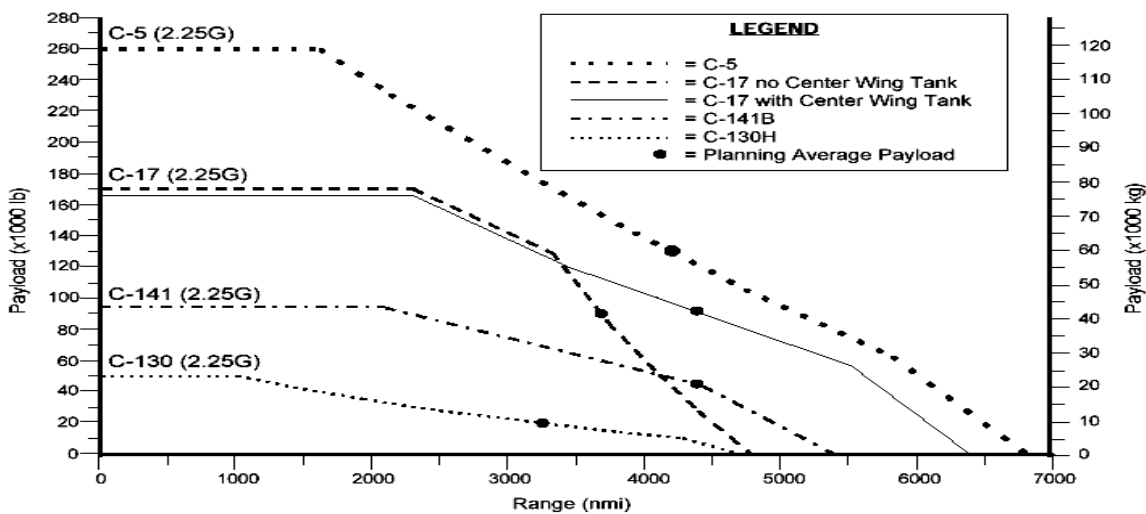


Figure 2 (Range of USAF Cargo Aircraft)⁵²

⁴⁸ Ibid, H-1.

⁴⁹ Julian E. Barnes, “Stormy Weather: Exit a CEO; enter a new case of cozy ties between Boeing and the Air Force,” *US News and World Report*, 15 December 2003, 36.

⁵⁰ Brian G. Chow, *The Peacetime Tempo of Air Mobility Operations: Meeting Demand and Maintaining Readiness*, RAND Project Air Force (Santa Monica, CA: RAND, April 2003), xvi.

⁵¹ Chow, 8.

⁵² “Airlift,” *FAS – Military Analysis Network*, November 1999, n.p. on-line, Internet, October 2000, available from http://www.fas.org/man/dod-101/sys/ac/lift_comp.htm.

While these problems exist, the use of strategic aircraft is in high demand. It is, most of all, fast and can provide access to remote areas of operation (i.e. Uzbekistan, Afghanistan, or the Northern Front for OIF). “There are many incentives to overcoming the tyranny of time and distance in the global trade of goods. One part of this demand will stimulate the airfreight business. This will mean an expansion of the number of large air-freight transporters globally.”⁵³ This section will focus on the statistics of moving the ARFOR component of JTF-Kashmir to India/Pakistan (as reflected from JFAST v.8.0). Additionally, this section integrates some of the ‘real-world’ examples for each discussion point.

For airlift support to JTF-Kashmir, this monograph worked off some basic airlift assumptions. First, we assumed the current levels of force commitments. In other words, OIF and OEF were in progress when the call to deploy to Kashmir was issued. Secondly, all strategic aircraft were based in CONUS, or were conducting other strategic missions in support of OIF/OEF. The forward preposition of strategic air lifters was not built into the final simulation run. Third, CRAF Stage 2 airframe numbers were assumed for the 40-day deployment period to South Asia.⁵⁴ Lastly, all contingency maximum on ground (MOGs) were assumed to develop near ‘real-world’ constraints in simulation (see Appendix A; also listed in the footnotes below for reference).⁵⁵ A detailed discussion of MOG and infrastructure will be later in the paper, under the sub-topic “Infrastructure.”

The concept behind using strategic lift assets to insert an initial operating force into Kashmir was to put an immediate capability in the JOA, exclusively by air, to demonstrate presence and deter any further aggression. For simulations purposes, initial operations capable (IOC) was defined as ARFOR/JFLCC C2, with adequate tactical air defense and infantry to provide a limited deterrent against potential threats not later than C+5 days (i.e. an Indian invasion of Pakistan). The planned schedule had an infantry battalion of personnel with their personal combat gear (LCE w/weapon), along with a

⁵³ Wass De Cege, 26.

⁵⁴ Notes, JFAST, v.8.0, Simulation Run (validated by USTRANSCOM J5 War Plans Division; POC LT. COL. William “Brent” Spahn and Mr. Phil Boyer), 04 Dec. 2003.

⁵⁵ Working MOGs: Kuwait Intl. = 3; Bombay India = 1; Srinigar India = 2 (not suitable for C5); Chaklala Pakistan (Islamabad) = 2; Masroor Pakistan (Karachi) = 1.

mechanized infantry company (with all of its organic equipment) to the APODs at Srinigar and Chaklala from Kuwait International Airfield within four days of C-Day. Accompanying this package was the two command and control centers from the JFLCC and two tactical air defense Bradley Stinger Fighting Vehicle (BSFV) batteries. All of this capability was combined with transportation enablers. By the end of C+5, there was a planned build up of approximately 3400 personnel (PAX) and 8300 STONs worth of combat gear.⁵⁶ For simulation, several AMC and CRAF stage-two aircraft were apportioned to PACOM for movement.⁵⁷ A combination of C5B, C17, and KC10, with CRAF Personnel (PAX) and Cargo aircraft was used to move the initial package into Northern India and Pakistan.

“Gulf War II... highlighted this fact: Airlift might well be indispensable to the American way of war, but the airlift fleet can handle no more than one major regional conflict at a time.”⁵⁸ This certainly demonstrated itself to be true in the simulation. In the first three days of the simulation, this combination of aircraft flew well over 8,000 STONs of equipment and over 3800 PAX into the JOA.⁵⁹ After looking at the results of the simulation, it is no surprise that virtually all of the aircraft in the inventory were flown non-stop in support of OIF.⁶⁰ For Kashmir, all of the outsized cargo was flown by AMC aircraft (C17 and C5B), while there was an even distribution of oversized cargo flown with AMC and CRAF carriers (see Appendix G). Certainly, the C17 fleet demonstrated its usefulness both in simulation and in OIF. In the simulation, all outsized cargo flown into Srinigar was done so by C17 (the existing runway length and MOG space is not compatible for C5B aircraft).

⁵⁶ MTMC-TEA Pamphlet 700-2, 66. This page defines the pounds per man to determine PAX weight. We calculated PAX for initial entry at 400Lbs (Web gear, weapon, rucksack, and duffle bags).

⁵⁷ Ibid, 69. Aircraft used in simulation:

- 30 x Long Range Wide-body Cargo	- 5 x C5B
- 36 x Long Range Wide-body PAX	- 15 x C17
- 10 x Short Range Narrow-body Cargo	- 20 x KC10
- 12 x Short Range Narrow-body PAX	

⁵⁸ John A. Tirpak, “The Squeeze on Air Mobility Command,” *Air Force Magazine*, July 2003, 24.

⁵⁹ Specifically, the numbers added up to:

Total:	PAX	STONs	Bulk STONs	Over. STONs	Out. STONs
	3879	11649.6	113.6	5879.2	5657.4

⁶⁰ Tirpak, 24.

As demonstrated by the simulation, commanders will increasingly rely on C17 aircraft to get outsized equipment into difficult APODs; however, the fleet is not everywhere and is centrally controlled. Quite obviously, an issue is simply the amount of aircraft in the standing inventory. “As of mid-2002, a total of 87 C-17s had been delivered with production running at about 15 aircraft per year.”⁶¹ Recognizing these numbers, for the deployment model to Kashmir, we only allocated 17% of the 2002 Total Active Inventory (TAI). The US Air Force’s goal is get a TAI of 120 x C17 aircraft, with recent fund appropriations allocating enough for an additional sixty (2006 = 180 x C17 A/C). However, this funding is predicated on the phased retirement of the C141 Starlifters (scheduled for final retirement in 2006) and the modernization of C5Bs (see Figure 3).⁶² Currently, the Total Active Available (TAA) for the C5A model is at 76 aircraft; C5B model is at 50 aircraft; and, the C141 is at 63 aircraft.⁶³ For our simulated deployment to JTF-Kashmir, we calculated for 1% of the TAA in C5B aircraft used. Lastly, in JFAST v.8.0, the system does not simulate aircraft that break down or have maintenance issues. Therefore, it is difficult to demonstrate the frustration of PAX and cargo that occurs when an aircraft breaks down. Even with the fleet of aircraft, and operating the MOGs for 24 hours/day, we still had 90% of our outsized equipment delivered late (see Appendix G).⁶⁴ In the simulation, the initial operating capability could not be reached on the ground, using air exclusively, within the five days desired.⁶⁵

⁶¹ Gordon, 197.

⁶² Ibid, 197.

⁶³ Ibid, 197.

⁶⁴ Late = Delivery date is greater than the specified Latest Arrival Date (LAD) in the TPFDDL. The simulation business rules were set at 5 x days from Early Arrival Date to LAD for aerial deliveries.

⁶⁵ The author could probably have alleviated the burden of outsized equipment by leaving behind the BSFV batteries, and pulling the Avenger platform instead. The impact of the BSFV was as significant as deploying additional mechanized infantry companies.

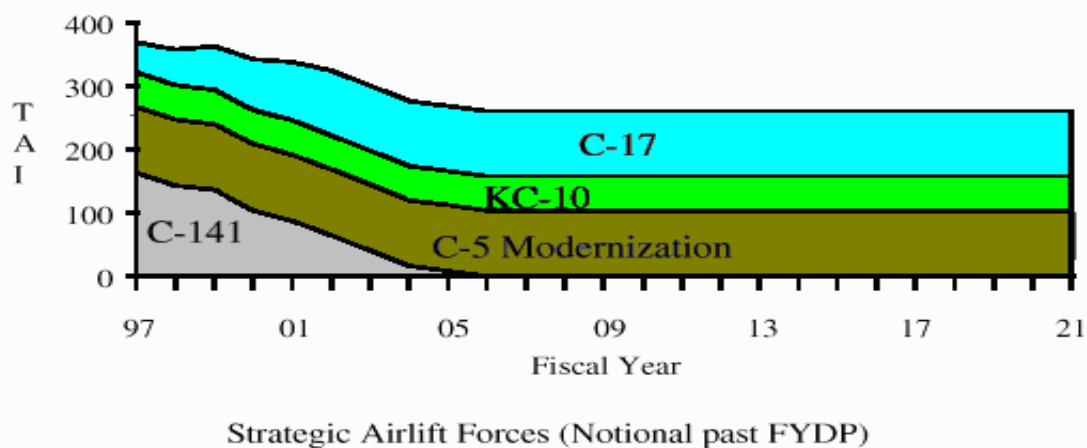


Figure 3 (Planned Phasing-out of C141, as of Nov 1999)⁶⁶

The Air Force has devised a proportional retirement of the C141 Starlifter with the procurement of new C17s (see Figure 3). The idea is to replace millions of ton-miles per day (MTM/D; the standard unit of measure for theoretical airlift capacity) gradually with the C17 and the modernized C5 for the aging C141. This phasing briefs well in theory, but is problematic in the ‘real-world.’ The first issue that faces AMC is that C141s are being retired faster than the procurement rate of the C17.⁶⁷ Reality is that cargo tends to ‘cube-out’ before it ‘grosses-out.’⁶⁸ This means that the physical dimensions of cargo and equipment prohibit it from being compliant with the physical dimensions for a particular aircraft type. This type of equipment is considered either non-air transportable or *outsized cargo*.⁶⁹ Because of this disproportionate retirement and procurement process, there are less aircraft and, thus, fewer numbers of airframes available to fly cargo.⁷⁰ This is a result of the fact that the C17 program is very expensive (\$180 million per aircraft) and congress has put strict spending laws on the Air Force as a result of the

⁶⁶ “Airlift,” FAS.

⁶⁷ HQ AMC/XPXPL “Strategic Airlift Capacity,” *Force structure FY 1996-2015 Informational Planning Sheets*. The figures are also addressed in the AMC Strategic Plan 2000, Section 2.4.1.

⁶⁸ Scott F. Smith, 73.

⁶⁹ JP 1-02, 394. Defined as “Cargo which exceeds the dimensions of oversized cargo and requires the use of a C-5 or C-17 aircraft or surface transportation.”

⁷⁰ Scott F. Smith, 73.

Mobility Requirements Study-05, which accompanied the 2001 QDR.⁷¹ This forces AMC to surge its aircraft in support of contingency operations in order to meet the desired hauling capacity.

In the case of our simulation to South Asia, all of our aircraft were not mission complete with their basic haul requirements until C+28 days (see Appendix G).⁷² After C+5, CRAF conducted the majority of the remaining PAX deliveries, while AMC concentrated on hauling delinquent cargo (frustrated by outsized requirements). This clearly demonstrates that without CRAF Stage-2 airframe numbers (in this scenario), AMC would be working double (in terms of hours, crews, and airframes) to meet the delivery demands (i.e. the aerial delivery of the initial force package and the latter split shipment of air and sea). Because of the time that sea delivery takes, the initial air surge is supposed to ensure a timely positioning of capabilities. However, with the amount of outsized cargo in a heavy brigade, it is extremely difficult to meet stringent timelines.⁷³ In the case of this simulated deployment, the lack of airframes for outsized cargo, combined with the working MOGs resulted in numerous late deliveries.

The second issue that AMC was facing before 9/11 was a decrease in total flying hours per airframe.⁷⁴ Contingency operations led to unpredictable schedules of surging, with long interim periods of inactivity. A decline of forward military basing and personnel, particularly in Europe, was one of the primary causes.⁷⁵ Furthermore, civil commercial carrier contracts increased, thus reducing the amount of cargo that needed hauling.⁷⁶ This led to a very costly and inefficient system of managing and maintaining aircraft.⁷⁷ As a result, the Mobility Requirements Study (MRS 05), which accompanied the 2001 QDR, reflected a pre-9/11 plan for projected airlift based on these “diminished” requirements.⁷⁸

⁷¹ Gordon, 198.

⁷² All categories of aircraft were maximized each day up to C+3, then AMC aircraft continued to deliver outsized/oversized cargo until air lines in the TPFDL were complete.

⁷³ This is due to a myriad of variables from number of crews available, maintenance issues, and utilization rates of the aircraft (the number of flying hours per day before maintenance is required).

⁷⁴ Chow, xvi.

⁷⁵ Ibid, 8.

⁷⁶ Ibid, XIX.

⁷⁷ Ibid, 26.

⁷⁸ Tirpak, 25.

Of course, this changed with 9/11 and OEF. In the simulation, this surge is reflected in increased flying hours up front. For instance, in the first three days of our simulated deployment, the apportioned C17 aircraft accumulated in excess of 500 flying hours.⁷⁹ For one C17, the average flying hours in three days was 35.16 (which equals 11.7 hours per day per aircraft). CRAF Stage 2 alleviated the workload on AMC for this operation by carrying 648.7 flying hours in the first three days. This comes to 216 flying hours per day (with up to 111 participating aircraft on any day between C and C+3). In this instance, without CRAF Stage 2 activated, it is safe to assume that the percentage of AMC aircraft would have been significantly larger and over burdened.⁸⁰ With all of this, bear in mind that the operational distances are only from Kuwait to South Asia versus Europe, CONUS, or Hawaii to India/Pakistan. Although the turn around time for aircraft is less, without CRAF Stage 2, this would be a significant amount of flying hours to cover in three days (again, 90% outsized cargo delivered late for the first five days of requirements with CRAF Stage-2). For a real-world perspective on the numbers generated in JFAST, it took 15 x C17s to drop the 173rd Airborne Brigade during OIF.⁸¹ Additionally, it required 27 round trips from Germany to Iraq to deliver five x M1A1 tanks, five x Bradley Fighting Vehicles (BFVs), 15 x Armored Personnel Carriers, 41x HUMVEEs, and the assortment of maintenance and repair equipment initially needed to support the force.⁸²

The unknown dynamic is what happens to the statistics on airlift requirements once the surge periods in the war on terror subside. For instance, in Fiscal Year (FY) 2002, AMC delivered 318,283 short tons (STONS) of cargo in support of Operation Enduring Freedom alone; this does not include the multitude of exercises (i.e. Ulchi Focus Lens and Dynamic Mix), humanitarian operations (i.e. western

⁷⁹ This was a result of the total delivery requirements. Total Flying hours/Aircraft from C-Day to C+3: C17 = 527.4; C5B = 117.1

⁸⁰ The simulation does not account for the fact that AMC contracts air for PAX and cargo movement; however, this is dollars spent in addition to the CRAF program. CRAF, when activated, does not require AMC to pay per mission or tail number.

⁸¹ Tirpak, 26.

⁸² Ibid, 26.

CONUS wildfires and Guam's typhoon relief), POTUS trips, and Operation Noble Eagle.⁸³ Once surge operations subside, there is still the requirement to sustain the operation. The impacts are significantly less though and schedules for sustaining are far more predictable. This, of course, assumes that there are no other concurrent surges required. These sustainment flights allow AMC to schedule and deliberately manage flying hours.⁸⁴ Regardless, the USTRANSCOM commander, GEN. John Handy, believes that another MRS is needed because of the increase in operational tempo since the attacks on 9/11/01.⁸⁵ He contends that, "...180 C-17s is insufficient... [and] that the real requirement ...was more like 222 C-17s."⁸⁶

In our simulation model, the location of the aircraft before C-Day is in CONUS and the time required to marshal and deploy those aircraft in support of the mission is ambiguous. Furthermore, the availability of crews to operate such aircraft is also ambiguous. According to Lt.Col. William Spahn, Chief of Plans at USTRANSCOM, calculations are developed based on the amount of short tons to be moved per day (by bulk/outsized/oversized). For our simulation, he expects that USTRANSCOM cannot guarantee any more than 500 STONs of Over/Outsized cargo per day.⁸⁷ Regardless of the type/source of aircraft, he guarantees that once the figure is defined by USTRANSCOM, they will do what is necessary to haul it (AMC, contracted air carrier, or CRAF). Nevertheless, the issue is the amount of aircraft to move short tonnage and the C2 for making those aircraft responsive. The ultimate goal is to combine assets, "to increase the tons delivered per day."⁸⁸ In the case of our simulated deployment to Kashmir, it is feasible to move by air from one forward deployed location to another, but not very efficient.

⁸³ USTRANSCOM, *2002 Annual Command Report* (Scott AFB Ill: USTRANSCOM, 2003), 2.

⁸⁴ Chow, XX.

⁸⁵ GEN. John W. Handy, Commander of AMC and USTRANSCOM, interviewed by John A Tirpak, May 2003, Air Force Magazine, Scott AFB, Illinois.

⁸⁶ GEN Handy interview.

⁸⁷ Lt.Col. William "Brent" Spahn, Chief of Plans (J5) USTRANSCOM, interviewed by the author, 04 Dec 2003.

⁸⁸ Wass De Cege, 24.

Sealift

*“The first and most obvious light in which the sea presents itself... is that of a great highway... over which men may pass in all directions, but on which some well-worn paths show that controlling reasons have led them to choose certain lines of travel rather than other... the reasons which have determined them are sought in the history of the world.”*⁸⁹ - RADM Alfred T. Mahan, 1918.

Sealift is the slowest and least flexible strategic mode of cargo delivery in today’s military inventory, but it is cost effective and has the greatest hauling capacity.⁹⁰ Unlike airlift, the sealift arm of strategic mobility can operate with three modes – surge capability, sustainment, and prepositioning.⁹¹ This allows the Military Sealift Command (MSC) the necessary flexibility for different scenarios in response to a contingency. With ongoing operations and the Global War on Terror, sealift has proved an invaluable capability for hauling large quantities of tonnage. There are challenges that MSC confronts for the future of sealift. First, the Ready Reserve Fleet (RRF) is costly to maintain during times of inactivity. Second, modern sealift ships were not designed to haul the dimensionally bulky military cargo. Third, lack of available crews and US regulations make it difficult for responsive and continuous use of US sealift assets. In our JFAST scenario, the assumptions for sealift were the same as for airlift. The locations of the various ships used were not manipulated to preposition them near the two Kuwaiti SPOEs (See appendix E). This section will primarily focus on the structure and issues regarding military sealift support, as they relate to the simulation results.

During World War II (WWII), sealift was the primary means for transporting personnel and cargo inter-theater. Since that time, our US flag and merchant marine fleet has diminished in its numbers and capabilities for supporting the US military.⁹² We must first examine the US government’s laws to understand the supporting nature of US sealift. First, The Military Transport Act of 1904 and the Cargo

⁸⁹ RADM A.T. Mahan, “The Influence of Sea Power Upon History, 1660 – 1783,” in *The Evolution of Modern Warfare*, ed. Dr. J.E. Brown, et.al., The Combat Studies Institute (FT Leavenworth KS: CGSC Printing Office, 2002), 412.

⁹⁰ MTMC-TEA Pamphlet 700-2, 11.

⁹¹ “Sealift,” *FAS – Military Analysis Network*, October 2000, n.p. on-line, Internet, October 2000, available from <http://www.fas.org/man/dod-101/sys/ship/sealift.htm>.

⁹² James Kitfield, “The Long Haul,” *Government Executive*, Vol.7, No.3, (March 1995), 35.

Transport Act of 1954 give priority to US commercial carriers for government cargo deliveries and requirements.⁹³ Similar to CRAF, the government will use these commercial carriers to haul cargo and personnel in times of war for varying financial rates. Furthermore, the Merchant Marine Act of 1936 allows the government to requisition the US commercial fleet for wartime purposes. Unfortunately, these laws left no financial incentive for commercial carriers to configure or design their fleet systems for DOD compatibility. As a result, the US commercial fleet with capability for military use has shrunk from 2114 ships in 1947 to just 247 ships in 1995.⁹⁴

In the void of government subsidy, carriers modernized, reconfigured ships, and contracted foreign flag carriers to meet the economic demands of increased globalization. Recognizing this phenomenon, the government purchased former merchant ships (no longer compatible for intermodalism) for maintenance and readiness.⁹⁵ The Department of Transportation's Maritime Administration (MARAD) controls these vessels until they are transferred to the control of MSC in times of war.⁹⁶ To assist this situation, The Maritime Security Act of 1996 established the Voluntary Intermodal Sealift Agreement Program (VISA; See Appendix C). This program, like CRAF, gives MSC the flexibility to provide adequate sealift over extended periods. Furthermore, it allows the RRF to concentrate on surge operations, while using the VISA craft for sustainment.

The intermodal system is a result of the increase in globalization and the need to streamline shipping efficiencies to meet global demand. The move from using Roll On/Roll Off (ROROs) ships to using containers allows industry to efficiently transfer goods and materials from a ship to line haul (trucking), rail, or expeditiously to another ship type.⁹⁷ This has not benefited the US military because

⁹³ Bradley E. Smith, "Sealift: Balancing Strategy and Capability," *Military Review*, Jul/Aug 1998.

⁹⁴ Kitfield, 35.

⁹⁵ "Strategic Sealift," *MSC Fact Sheet: USTRANSCOM*, December 2003, n.p., Internet, 29 December 2003, available from <http://www.transcom.mil/missions/mscfact5.html>

⁹⁶ "MSC Civilian Mariners do 'Double Duty' as MSC Reservists," *Naval News Service*, 12 June 2003, n.p., Internet, 12 June 2003, available from http://www.news.navy.mil/search/display.asp?story_id=7956

⁹⁷ Katherine M. Peters, "By Air or By Sea," *GovExec.com*, 15 December 2002, 6, n.p., Internet, 19 January 2004, available from <http://www.govexec.com/features/1202/1202s2.htm>

most of our essential equipment was not designed for containerization. Thus, Bradleys, Tanks, and Helicopters fit well into the aging ROROs while commercial shipping modernizes for intermodal shipping of efficiently designed cargo (i.e. Japanese Cars or Imported materials from Europe). Lastly, intermodal systems, in a globalized world, are theoretically more cost efficient (i.e. in terms of crews needed, maintenance, and time; see Figure 4).

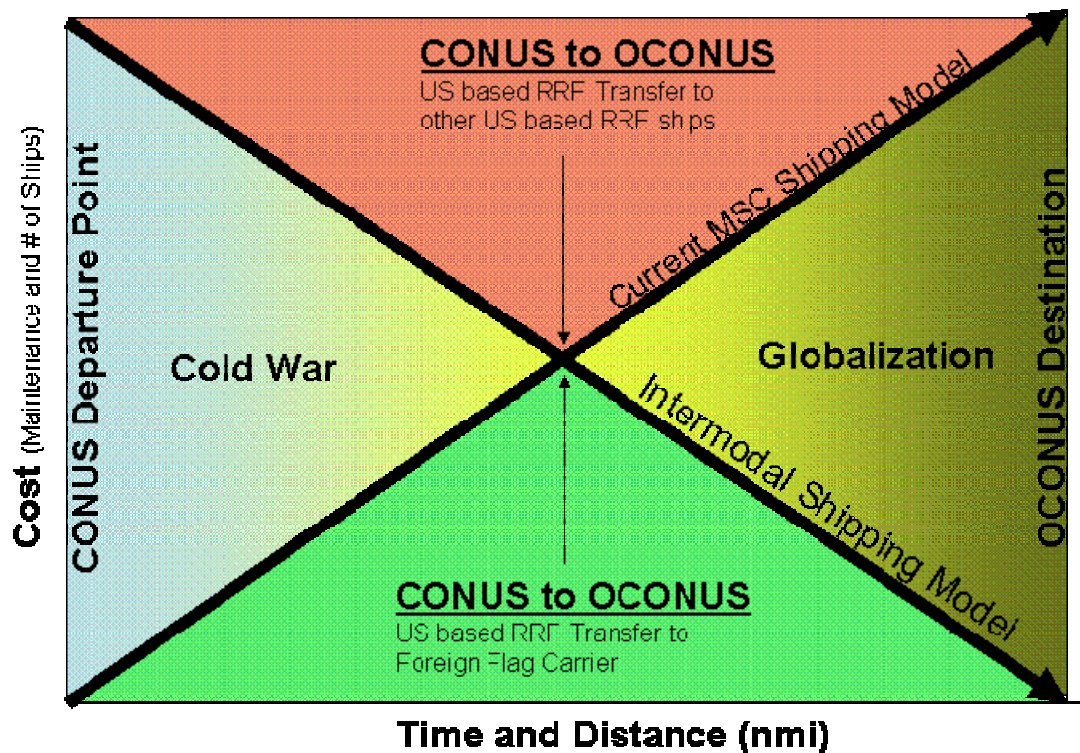


Figure 4 (MSC Intermodal Shipping Model)⁹⁸

During Desert Storm, almost 95% of all tonnage hauled in military operations was done so by ships.⁹⁹ MSC hauled more than 10 million tons of cargo in support of USCENTOM during Desert Storm.¹⁰⁰ This did not happen without significant challenges. First, the Ready Reserve Fleet was practically in ‘mothballs.’ Of the available ships, there were no ready Light to Medium Roll On/Roll Off

⁹⁸ Author generated diagram from deductive logic based on readings.

⁹⁹ Gordon, 200.

¹⁰⁰ “Strategic Sealift,” *MSC Fact Sheet*.

(LMSR) ships and only 8 x Fast Sealift Ships (FSS).¹⁰¹ Of the 183 total ships used in Operation Desert Storm for hauling equipment and cargo, 38 were foreign-flag ships.¹⁰² The use of foreign flag carriers allows the military to circumvent some of the stringent requirements/regulations placed on US crews, therefore providing more timely and cost effective means for moving tonnage, and provides more responsiveness due to locations of the ships (i.e. European ships hauling European based military equipment).¹⁰³ Another advantage to foreign carriers is their ‘not as modern’ fleet, which can accommodate the bulky military equipment (i.e. breakbulk and RORO vessels).

Almost ten years later, for OIF, MSC used more than 70% of its total lift capacity to support the movement and sustainment of US forces (See Figure 5).¹⁰⁴ As a point of interest, it took MSC up to 37 ships to haul the entire US 4th Infantry Division.¹⁰⁵ In simulation, it took only 8% (14) of the total available MSC ships to move the ARFOR from the SPOEs in Kuwait (See Figure 5). Specifically, it took seven breakbulk ships, five FSS, and two Roll On/Roll Off (RORO) ships to deliver the ARFOR component of JTF-Kashmir within 40 days (C+40).¹⁰⁶ The ships with US 4th ID went into Modified Location (MODLOC) and allowed planners to call forward capabilities, as needed, to the port of Ash Shuaybah.¹⁰⁷ This provided a great amount of flexibility, as the equipment was force packaged by capability, therefore accommodating a rapidly evolving plan.¹⁰⁸

¹⁰¹ Ibid.

¹⁰² Tiberi, 11.

¹⁰³ “Strategic Sealift,” *MSC Fact Sheet*.

¹⁰⁴ RADM D.L. Brewer III, “Commander’s Comments,” *MSC News On-line*, May 2003, n.p., Internet, 29 December 2003, available from <http://www.msc.navy.mil/sealift/2003/May/comments.htm>.

¹⁰⁵ Ibid.

¹⁰⁶ A total of 166 x ships were available for lifting the ARFOR from Kuwait to South Asia. Average trips for the 7 x breakbulks = 1.4/ship; Average trips for the 5 x FSS = 2.8/ship; and, Average trips for the 2 x ROROs = 1.5/ship. Furthermore, we demonstrated that 6% of the total RORO fleet, 7 x Breakbulk ships, and 5 x FSS could deliver such a large package in less than 40 days.

¹⁰⁷ Ships in MODLOC usually go into a maritime orbit, loitering in anticipation of an operation at a nearby littoral.

¹⁰⁸ Notes, SAMS- Joint Deployment Planning Elective, LTC John Metz, Jan 2004.

Strategic Sealift Programs

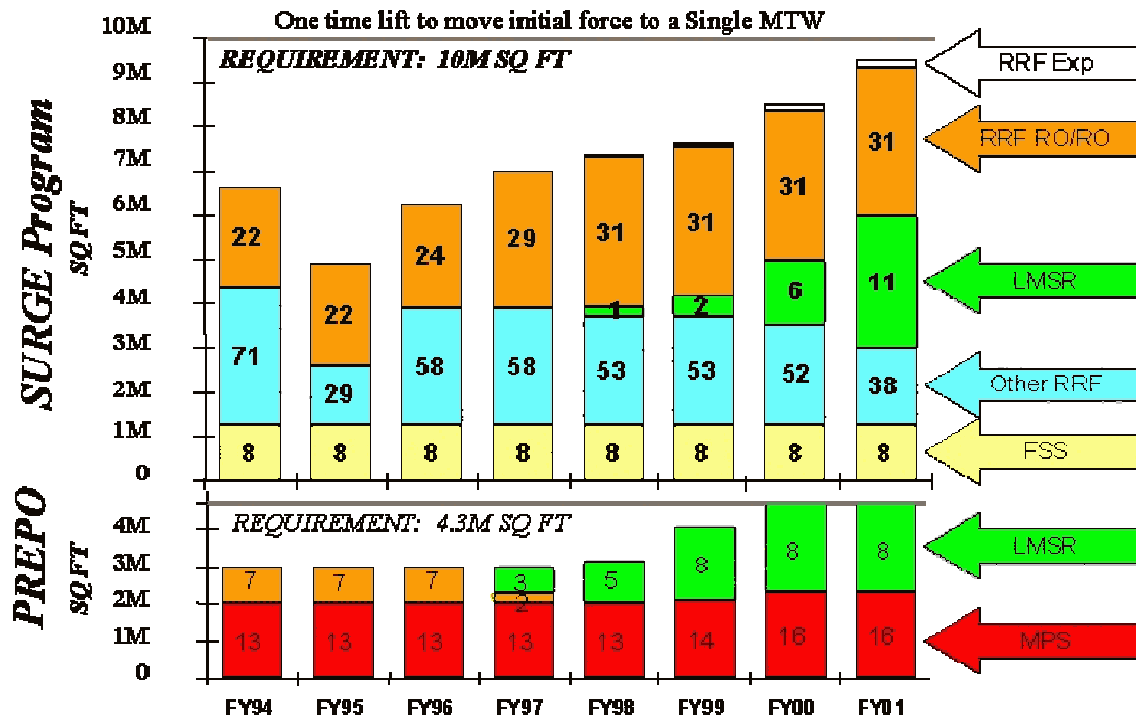


Figure 5 (Composition of MSC Assets prior to OIF)¹⁰⁹

For the simulation, this small, but dedicated fleet was able to conduct 27 trips from Kuwait to South Asia to ensure a timely delivery. Only on C+26 and C+27 were all of the available, apportioned ships used simultaneously, which demonstrate the flexibility and cost effectiveness of a small forward deployed fleet and force.¹¹⁰ The FSS ships performed more voyages because of Newtonian Physics (they steamed faster, with greater capacity, and have the organic equipment for offloading equipment).¹¹¹ In total, the first set of ships (2 x FSS) arrived at the two designated SPOEs by C+14 (embarking at C+16),

¹⁰⁹ "Sealift," FAS.

¹¹⁰ Over a 29 x day period, the deployment averaged 7.5 ships being used per day.

¹¹¹ In 29 deployment days, the FSS apportioned fleet averaged 2.8 trips/ship, and conducted a total of 14 trips.

and all apportioned ships were complete with all required/desired hauling commitments by C+37.¹¹²

Recall, that air still was delivering delinquent cargo until C+28.

This clearly demonstrates that at a given point, it is more cost effective to move equipment by sea versus air (see Figure 6). It also negates the premise that heavy forces are not rapidly deployable; rather, it is a matter of physics and location (laws of nature). Additionally, without a task organization for combat, the SBCT battalion roughly weighs between 2500 and 3000 STONs.¹¹³ However, this does not include support packages that need to be included to provide adequate logistics. A mechanized infantry battalion weighs 4012.2 STONs with organic support.¹¹⁴ Lastly, it is likely that a Stryker will not cube-out before a Bradley fighting vehicle in a C130, but this is also irrelevant in the context of strategic deployment. Strategic moves, whether by air or sea, require platforms that are capable of moving outsized equipment over great distances (i.e. ships, C17 or C5 aircraft). As we will discuss in a subsequent section, the size of the air or sea fleet is not the issue, it is the infrastructure, which facilitates the off-loading.

¹¹² At 18 Knots/Hour, the average travel time from Kuwait to India was 4 x Days (3 Days for Pakistan). However, depending on gross tonnage, the FSS could steam at 25 Knots and cut that time by 2 x days. The first two ships to arrive in Kuwait were two FSS which were already in the region (either OIF resupply or another USCENTCOM mission); they were able to start loading on C+16 (embarking on C+18). The first arrival to Nhava Sheva was on C+23, but the download was not complete until C+24.

¹¹³ Scott F. Smith, *Boots in the Air*, 42. The author took Scott Smith's weight of the SBCT from his monograph *Boots in the Air: Moving the New Army Brigade* (10,000 STONs), and divided by four to gain a rough appreciation for what one battalion would weigh (2500-3000 STONs). Understanding that there are complex dynamics to weighing a battalion, the author's point is that the SBCT (unlike a Mech. Infantry Battalion) does not have an organic support capability to even out the weight in comparison to a conventional mechanized battalion. Therefore, a reasonable assumption is that the SBCT would be task organized with an adequate support package in the event of an operational deployment; thus, increasing the amount of lift required.

¹¹⁴ Author JFAST TPFDD; sourced from MTMC-TEA data.

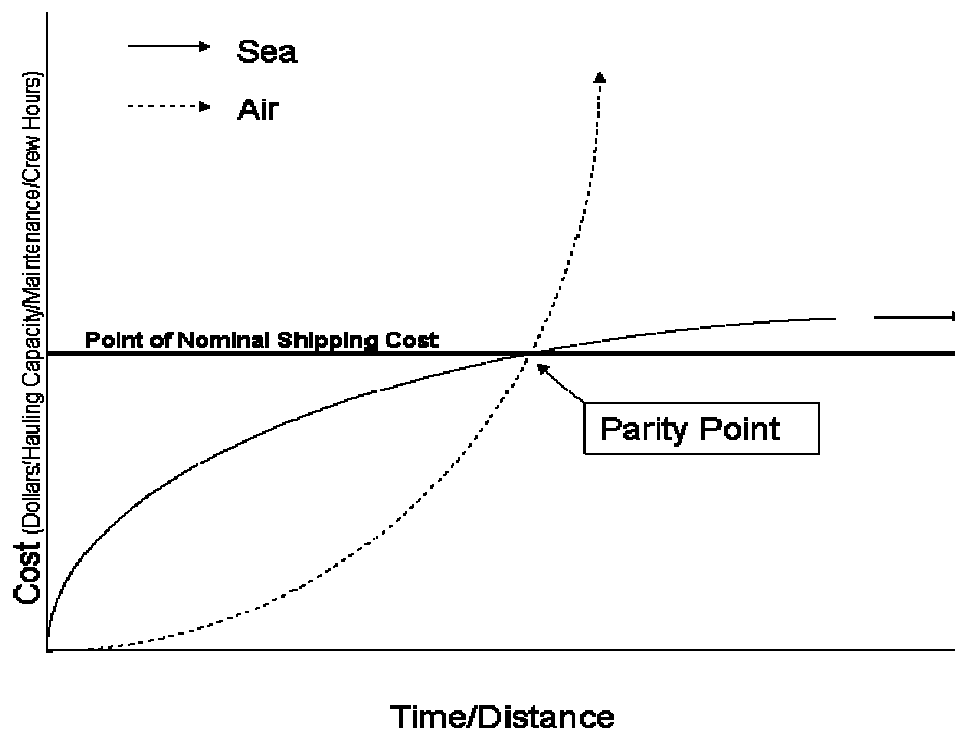


Figure 6 (Theoretical Shipping Model)¹¹⁵

The use of Reduced Operating Status (ROS) has proven beneficial, but at a steep price. Designed to keep portions of the Ready Reserve Fleet as close as four days notice, there are three stages to ROS: 0-4 days at a cost of \$3 million per ship, 5-10 days at a cost of \$2.8 million per ship, and 10-20 days at a cost of \$2.4 million (all in 1995-dollar estimates).¹¹⁶ Contrast these costs with the amount of tonnage delivered for operations, and then it makes sense to have a ready set of ships for which to deliver equipment. For example, in first month of Operation Restore Hope, more than 1.1 million square feet of delivered cargo went by sealift.¹¹⁷ Additionally, thirty RRF vessels were activated and used as a part of

¹¹⁵ Author generated diagram (designed to be conceptual).

¹¹⁶ Peter C. Laches, "An Analysis of the Mobility Requirements Study and the Future of Strategic Airlift," *Naval Post Graduate School Monterey* (Monterey, CA: NPGS, 1993), 30.

¹¹⁷ David Kassing, *Transporting the Army for Operation Restore Hope*, RAND (Santa Monica CA: RAND, 1994), 35.

the flotilla to haul the gear for the US 4th Infantry Division in OIF.¹¹⁸ These ships, along with the prepositioned ships from APS-3 (Diego; prepositioned), delivered over 4 millions square feet of cargo (228,000 Tons) back to the US from Kuwait after the ground offensive phase of OIF.¹¹⁹ Contrast these dollar amounts with the infrequency of activity and the use of sealift is inefficient. However, given that the war on terror and a foreign policy of preemption, the US military will be forward deployed and extremely needy in the next decade. Therefore, the use of shipping will eventually pay for itself as the workhorse for hauling large quantities of goods and materials to distant locations (see Figure 6).

The European Union is attempting to broaden its strategic sealift base as "...EU member states have, variously, relaxed requirements, devised alternative registers or supported their registers with state aid..."¹²⁰ This puts the current US construct for relying (primarily) on US flag ships as potentially inefficient and limiting. For instance, US sealift accounts for one percent of the world's shipping market, leaving the DOD vulnerable to high costs with limited choices.¹²¹ Additionally, the locations of US flag ships vary on a daily basis; thus, reducing the reliability of shipping to be readily available for contingency missions. Thirdly, US law requires vessels to abide by certain codes and regulations concerning crew licenses, operational constraints, and vessel maintenance. Most of these laws exist so that the interaction between ship and port remains efficient and safe. However, with foreign countries, especially in the areas of instability, the use and need for some of these very stringent regulations is variable and questionable. The Europeans have an obvious advantage as they can select the mode of sealift based on time sensitivity and cost across an array of available choices throughout the European Union (EU).¹²² In closing, our simulation clearly demonstrates the efficiency and effectiveness of sealift,

¹¹⁸ "MSC in Operation Iraqi Freedom," *Naval News Service*, 14 Aug 2003, n.p., Internet, 29 December 2003, available from <http://www.globalsecurity.org/military/library/news/2003/08/mil-030814-msc01.htm>

¹¹⁹ Naval News Service, MSC in OIF.

¹²⁰ Jon von Weissenberg, "Strategic Sealift Capacity in the Common European Security and Defence Policy," *National Defence College, Series 1, no.20* (Helsinki Finland: Department of Strategic and Defence Studies, 2002), 81.

¹²¹ Peters, 7.

¹²² Weissenberg, 81.

as compared to airlift, when the locations of the PODs and POEs are such that time and geography are easily mitigated through the proximity of the deploying unit's equipment.

Prepositioning

*"To make sure that designs [army formations and warfare in the early seventeenth century] would not be frustrated... , military writers of the early seventeenth century advised their readers to set up numerous magazines in conveniently situated towns and fortresses. A well-appointed camp should always have fifteen days' provisions in store, to be touched only in emergency."*¹²³ – Martin Van Creveld, *Supplying War*, 1977.

The military learned valuable lessons from its attempt at initial entry through prepositioning in Operation Restore Hope (Somalia 1992). Two, LASH class, ships were ordered [by USTRANSCOM] to the port of Mogadishu in early December 1992. Upon arrival, they were unable to enter the port due to the heavy weight of cargo on the ship relative to the draft of the port. Subsequent attempts to offload the cargo, off the coast, and haul it into port with barges failed when weather extremes posed significant risk to the cargo and personnel. As a result, the ships embarked to Mombasa, Kenya where they conducted a cross load of their cargo with another prepositioning ship that had already off loaded cargo in support of the Marines at Mogadishu. However, Kenyan port authorities would not allow for this exchange due to the excessive lengths of the two LASH ships (berthing issues). These two ships were ordered back to the port of Kismayu, Somalia to attempt to download their cargo; again, they ran into access and weather problems. Finally, they returned to Diego Garcia and cross-leveled cargo with an FSS, which did not make the port of Mogadishu until 15 February.¹²⁴ For more details on the Military Prepositioning Program, refer to Appendix E of this monograph. This monograph primarily focuses on Combat Prepositioning Ships operated for the U.S. Army (APS-A) and it's two primary challenges: generically tailored equipment sets and challenges to maintaining these equipment sets. First, prepositioned equipment under the Army War Reserves program is generic and generally not tailored to the specifics of

¹²³ Martin Van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge UK: Cambridge University Press, 1977), 17.

¹²⁴ Kassing, 32.

the unit's warfighting operating procedures and configurations. Secondly, once positioned, maintaining the equipment is challenging due to lack of personnel, exposure to the elements, and lack of available maintenance space. Lastly, once utilized, there is a critical decision point of what to replace the sets with and how much.

Because of the Persian Gulf War of 1991, the military recognized the importance of having forward stocks of combat and enabling sets of equipment.¹²⁵ These prepositioned stocks proved invaluable during OIF when the US 3d ID was able to draw APS-5 Kuwait/Qatar and a brigade set from the afloat prepositioned sets in Diego Garcia (APS-3). It allowed the division to move its personnel rapidly from Georgia to Kuwait without a 'longer-than-necessary' waiting period abroad. These prepositions, however, were wrought with problems and did not contain all of the necessary equipment for the US 3d ID to warfight. Moreover, the 3ID experienced equipment shortages, the need for more modernized equipment sets, and maintenance shortfalls in the prepositioned sets. As a result, the division was forced to identify shortfalls in the forward sets and make up deficiencies by deploying some of its CONUS/organic equipment forward.¹²⁶ For instance, the Bradley Stinger Fighting Vehicle – Operation Desert Storm model, the Army's new FMTV troop and cargo carriers, additional power generation equipment for modern tactical operations centers, and modern radios and installation kits all had to be shipped from CONUS.¹²⁷ What resulted was that USTRANSCOM only had to provide five ships to the US 3d ID to carry rolling stock and equipment to make up its identified shortfalls.¹²⁸

Another concern for prepositioned equipment is with the care and maintenance of the sets. Again, this is not a uniform problem throughout the inventory. For instance, during REFORGER exercises in the 1980s, POMCUS equipment from the Combat Equipment Group-Europe (CEGE) were drawn, maintained, and used quite regularly by participating CONUS-based units(see Appendix E). However, with APS-Afloat (i.e. Diego Garcia), it is conceivable that equipment sets will go for years

¹²⁵ "Sealift," *FAS*.

¹²⁶ Hodge, 3d ID AAR.

¹²⁷ *Ibid*.

¹²⁸ *Ibid*.

without being drawn and used. Army Material Command (AMC) hires contractors to conduct limited maintenance on the sets. However, if an entire brigade of soldiers have difficulty maintaining their own pieces of equipment; it is difficult to imagine a hand full of contractors being able to keep a complete brigade set fully mission capable. A General Accounting Agency Report in 1997 revealed that 25% of the pre-positioned equipment did not meet Army readiness standards. Furthermore, most of the equipment issues were with APS-Afloat sets versus APS-Land (APS-L) sets.¹²⁹ This can be attributed to the fact that APS-L sets are periodically drawn for operations and exercises (i.e. Operation Intrinsic Action).

These issues do not diminish the necessity for APS-A sets of equipment. In OIF, “Thirty-three of the 42 ships in the Prepositioning Program were underway or had already off-loaded gear for war-fighting forces in the Persian Gulf area.”¹³⁰ Again, this allowed for more flexibility in planning and operational execution; although, one can deduce the tactical level problems that soldiers and officers dealt with on account of drawing equipment that had not been drawn or used in long periods of time.¹³¹ Additionally, programs can be instituted which will mitigate these maintenance issues. Obviously, the maintenance of APS-L sets is less challenging than APS-A (because of physical space, the rotation of units to draw and conduct maintenance, and the amount of contractors that can be hired to manage the sets). However, money and funding are critical to any instituted maintenance program. In the final assessment, prepositioning afloat provides significant challenges to maintain the equipment, but allows for significant operational flexibility required of a force operating in a globalized world (see Figure 7).

¹²⁹ United States General Accounting Office, Letter Report NSIAD 97-169, *Afloat Prepositioning: Not all Equipment Meets Army's Readiness Goal* (Washington DC: Government Printing Office, 1997), 1-4.

¹³⁰ Brewer, Commander's Comments.

¹³¹ Hodge, 3d ID AAR.

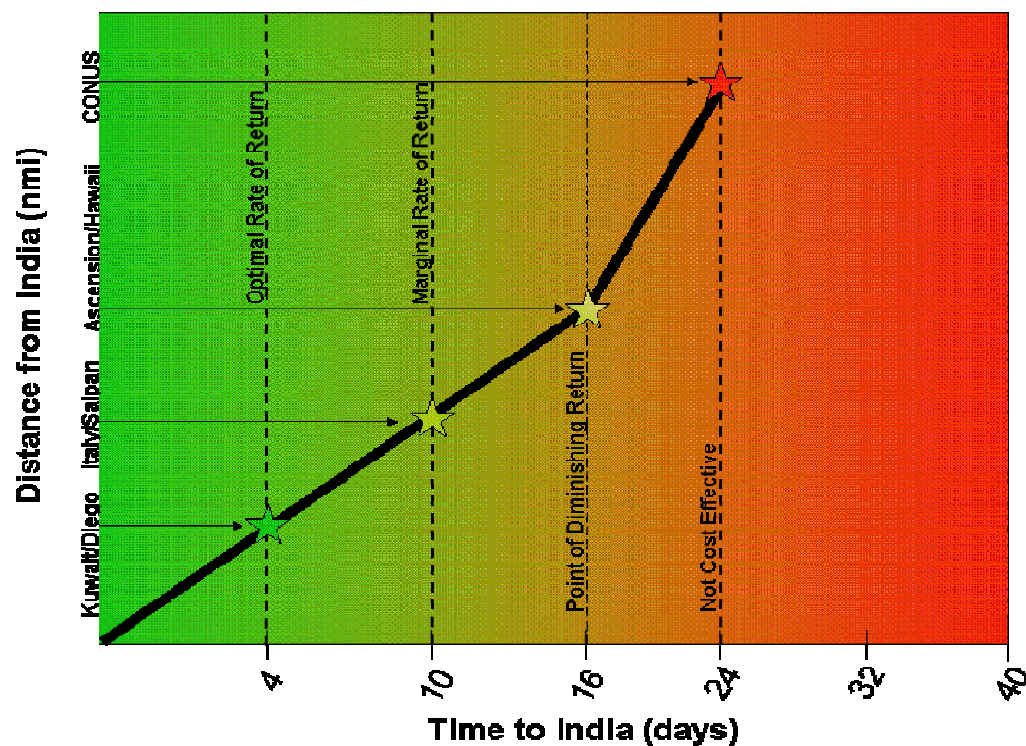


Figure 7 (Preposition Model)¹³²

The last risk to investing in APS sets is the costs and decisions associated with replacing these sets. For instance, after using the APS-3 and APS-5 sets of equipment for OIF, the DOD is facing a critical decision in the types and locations of equipment it feels compelled to position. Once that decision is made and the finances are allocated, it is potentially more costly to retract on it in the near future. As a result, the types and locations of these equipment sets is a direct reflection of the National Military Strategy for the US to deal with the fluidity and complexity of a globalized world. Additionally, investing in APS-L is, strategically and operationally, a more risky venture, as it is difficult to divine the locations of the next series of conflicts. Furthermore, APS-L requires coordination with other sovereign nations in relatively benign environments for an adequate facility to operate.

¹³² Author generated diagram. JFAST Sea Port to Port Calculator with Speed of Vessel = 18 Knots/Hour. Actual times (in days) to India are: Kuwait = 3; Diego = 4; Livorno, Italy = 10; Saipan = 12; The Ascension Islands = 16; Honolulu, Hawaii = 19; San Diego = 24; and, Charleston SC = 19.

The issue is that these nations, in which we choose to position equipment, must be readily accessible to the swath of instability that is identified with our current strategic challenges (see Figure 7). It is difficult to determine which of these countries are strong enough to withstand the instabilities that threaten the very region they reside. For example, Senegal is relatively stable, compared to its native region, but the risk associated with housing contractors and maintaining equipments sets in Dakar far outweighs our need to do so in the region. However, there is no doubt strategically that the US may find itself conducting humanitarian or non-combatant evacuation missions in this volatile region of Africa.

Following OIF the US Army has to make these strategic level decisions, which will provide the flexibility necessary for future combatant commanders and the President. With the Iraqi Baathist threat defused, the Army decided to reduce the amount of brigade sets in Southwest Asia. Additionally, Army Material Command's new programs for APS-A sets are the Army Regional Flotillas (ARFs) and "positioned as 1x1 BDEs not only in the Indian and Pacific Oceans, but also in the Mediterranean Sea (see Appendix E & Figure 9)."¹³³ The obvious advantage to having sets of equipment afloat is the operational and strategic flexibility and statement of types of regional commitments. Additionally, the decision on the locations and types of equipments sets will not only reflect the contemporary National Military Strategy, but also drive future policy.

In a globalized world, these configurations will define how the Army structures its force, as a whole. For example, if the Army Chief of Staff decides, with Army Material Command (AMC), to forward position unit sets of Strykers, then there are implications for the maintenance and use of heavy forces. These impacts do not just affect the heavy community within the Army; they also affect various elements of USTRANSCOM, who would be left with the challenges of transporting such heavy forces quickly from CONUS. Oppositely, if heavy unit sets are positioned, then USTRANSCOM must develop a strategy around transporting the remaining packages of capabilities from CONUS (i.e. Stryker or

¹³³ Gary Motsek, "US Army Material Command," briefing, Society of Logistics Engineers, 16 October 2003. "The first of the ARF 1x1 BDE vessels (WATSON) was uploaded in Aug '03 and is now on station. In March 04, the second ARF 1x1 BDE will upload and the third ARF 1x1 BDE upload is planned to occur in early FY06."

light/airborne forces). Another impact is on the deployment cycles and training of the various units. For instance, positioned sets of heavy unit equipment imply that additional monies will be spent for identical equipment sets to allow for training in CONUS. In addition, the issue of digitizing the force puts the Army and AMC in a dilemma. The sets positioned forward will have the challenge of remaining technologically relevant or face a situation where units are degraded in warfighting capability. For instance, the US 4th ID would have found it extremely difficult to draw the APS-3 brigade set for a fight because of the digitization training and operating procedures developed around their unique digital systems for warfighting. Similarly, a digitally endowed set of prepositioned unit equipment may become obsolete while in position, forcing a dilemma upon the unit conducting a contingency operation.

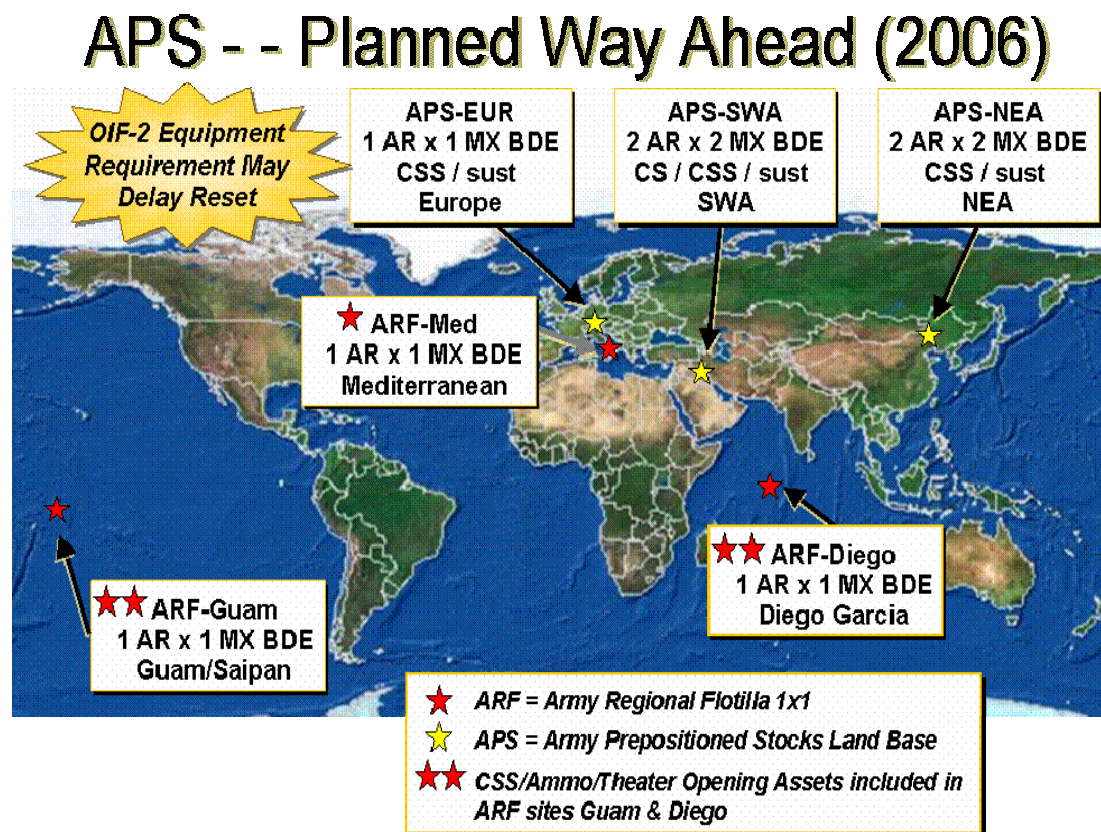


Figure 8 (AMC Plan for the Army Regional Flotilla, ARF, Concept)¹³⁴

¹³⁴ Ibid.

Infrastructure

*“Does anyone think our next mission will be in a first world country? No, we will continue to go places that lack everything from major air and seaports to railways, bridges, and road networks.”*¹³⁵ – MG James Dubik, 2000.

All three pillars to the strategic mobility triad are obviously crucial to ensuring that deploying cargo and personnel get to their destinations in a timely manner. However, without the proper infrastructure at both the POEs and the PODs, a complete armada of aircraft and ships could not efficiently offload their personnel and cargo to meet the ‘Latest Arrival Date - LAD’ deadline (see Appendix A for LAD definition). The capability to build a throughput capacity is the critical link to rapid delivery of personnel and cargo (see Appendix A for definition of “throughput”). To facilitate this operation, USTRANSCOM relies on the Surface Deployment and Distribution Command (SDDC; formerly known as the Military Traffic and Management Command, or MTMC) to operate terminal facilities (see Appendix F). SDDC has the role of ensuring an efficient offload of equipment and personnel at both the Sea POD (SPOD) and the Aerial POD (APOD). This section will discuss the two basic types of ports, air and sea, and the challenges associated with each. Additionally, we will contrast the throughput capabilities reflected in the JFAST simulation against the discussion of each area to reveal some points of interest.

As explained in the previous section (Prepositioning), the attempts to get the prepositioned sets of equipment into Mogadishu were futile because of infrastructure issues. Four factors contributed to the slippage of deliveries in shipping to Operation Support Hope: time of ships in port, multi-port of ships to collect equipment, one ship had engineering problems (which slowed its speed), and the berthing capacity at Mogadishu.¹³⁶ As this example implies, a fleet of ships or aircraft with no place to land or berth is just as ineffective as no fleet at all. Although not all of these factors are easily predicted, the time that ships remain in port is controllable and that is where the SDDC and unit loading/off-loading

¹³⁵ Major General James Dubik, “IBCT at FT Lewis,” *Military Review*, September – October 2000, 18.

¹³⁶ Kassing, 37.

procedures factor heavily. Additionally, the expedient onload and offload of personnel and cargo at designated SPODs/APODs assist in determining the time required to deploy units to a theater of operations. MSC, AMC, and SDDC are designed to work together to ensure an efficient operation at the SPOD/APOD in support of the regional combatant commander's deployment requests. Conditions, however, will seldom be ideal because the area of the globe (described earlier in the monograph), which the US military will likely operate, is not an area of robust economics; therefore, the infrastructure is probably not robust.

Throughput at an airfield, or APOD, is a function of a few factors, all of which are of a dynamic nature. First is the maximum number of aircraft that can be accommodated on the ground for various uses, often referred to as the MOG (maximum on ground). There are different types of MOG, but we will refer to the three most common: working MOG, parking MOG, and fuel MOG.¹³⁷ For the purposes of this paper, we will primarily focus on the working and parking MOG since most airfields with limited throughput capacity will not allow for much more.¹³⁸ Usually in contingency operations, ground-refueling operations can be limited in the Joint Operational Area (JOA). Of course, this depends on several dynamics; such as, the area of the world, conditions of the fueling infrastructure, and the quality of the fuel. For instance, sub-Saharan Africa has limited fueling capability as compared to Europe or South West Asia. The US military does not regularly operate in this region; therefore, limited investments in fueling infrastructure have occurred. Furthermore, for the simulation, it was assumed that the fueling capability at Kuwait International, Masroor, Bombay, and Chaklala is adequate, but Srinigar is not adequate.¹³⁹

¹³⁷ Air Force Pamphlet (AFPAM) 10-1403, "Airlift Planning Factors," March 1, 1998, 24.

¹³⁸ MOG for simulation: Kuwait Intl – 3; Bombay India – 1; Srinigar India – 2 (not suitable for C5; implies that a trans-shipment point is required if inbound cargo is delivered by C5B); Chaklala Pakistan – 2; and, Masroor Pakistan – 1. Average throughput capacity by day for APODs in the simulation was: Kuwait Intl = 800 STONs/4800 PAX; Srinigar = 550 STONs/2300 PAX; Bombay = 290 STONs/1600 PAX; Chaklala = 550 STONs/3200 PAX; Masroor = 290 STONs/1600 PAX.

¹³⁹ In the simulation and because of the operational distance, the author assumed refueling operations at Kuwait International. Therefore, the time on the ground for offload was not based on time to refuel.

Secondly, Material Handling Equipment (MHE) represents a vulnerability to ensuring timely and efficient throughput at a particular APOD. Until recently, MHE was the weakest of the critical links to ensuring adequate throughput at an APOD. Specifically, the 40k and 25k loaders had interoperability issues with commercial aircraft.¹⁴⁰ Furthermore, aging systems increased the percentage of unreliable equipment, making Tanker Airlift Control Element (TALCE) operations challenging (see Appendix A for TALCE definition). As stated in an online report, “Sixty-nine percent of the 25K loader fleet is comprised of old, deteriorating Emerson and Con Diesel loaders that are reaching the end of their service life extension.”¹⁴¹ AMC has initiated a program for purchasing more interoperable 60k loaders. Recognizing the impact of infrastructure on throughput capacity, AMC has made the purchase of next generation small loaders (NGSL) and 60k Tunner and Halvorsen loaders a high priority (see Figure 10).¹⁴² As of OIF, these Tunner and Halvorsen loaders made significant impacts on our ability to increase throughput capacity at APODs.¹⁴³

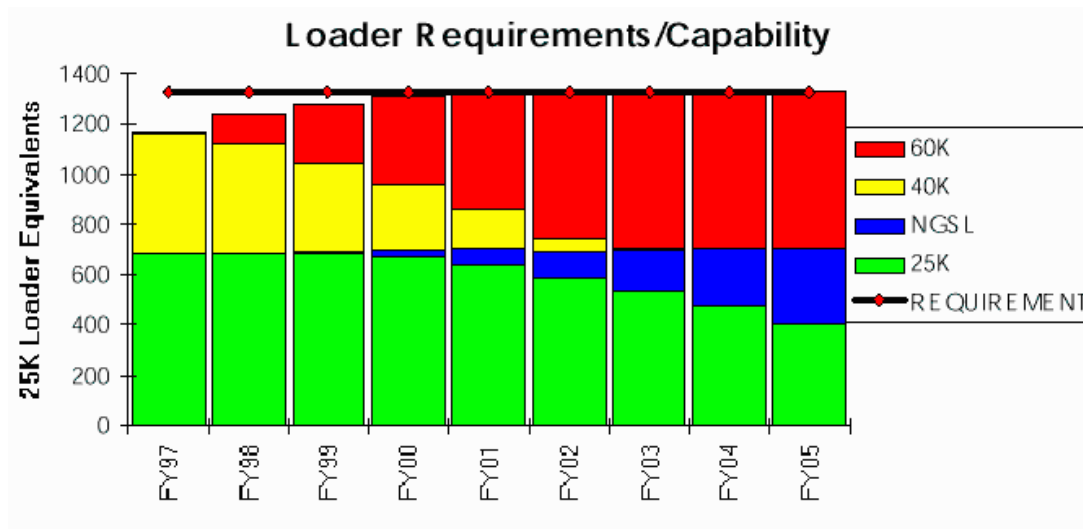


Figure 9 (Infrastructure – MHE Projected Requirements as of NOV ‘99)¹⁴⁴

¹⁴⁰ “Airlift,” *FAS*.

¹⁴¹ *Ibid.*

¹⁴² *Ibid.*

¹⁴³ Tirpak, 29.

¹⁴⁴ “Airlift,” *FAS*.

Lastly, and because of OIF, AMC fielded new Global Assessment Teams (GAT) to travel to remote airfields with ground units to survey the infrastructure for use of airlift assets. This allowed AMC to determine where the effort of MHE, fuelers, and TALCE should be weighed.¹⁴⁵ For OIF, approximately 10 x TALCEs were utilized (at the height of airlift operations) conducting such activities as providing lighting for airfields, contracting and deploying adequate MHE, and conducting remote airfield surveys for anticipated use.¹⁴⁶ One of the main issues in deploying, in simulation, to South Asia was the amount of cargo that one airfield could handle in a 24 hour period. For instance, Port Opening Support Equipment was scheduled for aerial delivery into Bombay, India in the opening days of the deployment. However, the delivery requirement exceeded the throughput capacity of the airfield by 200 STONs. These issues will cause serious frustration in the TPFDDL and an accurate assessment will allow for more informed decisions on POD locations and mode/source of delivery.¹⁴⁷ The need to get assessments on potential APODs is critical to successful airlift. Although airlift will never be capable of delivering the bulk amounts of cargo that sealift can deliver, this initiative to assess potential APODs and determine the type infrastructure necessary will greatly enhance our ability to project force by air.

One of the largest challenges to throughput is building the infrastructure necessary to support sealift operations. Several dynamics weigh heavily into gaining adequate access into a country's seaport. First, the physical infrastructure must support the types of ships for berth. The draft at differing tide levels, the storage space, available lighterage, hazardous materials (HAZMAT) storage and petroleum (POL) storage/offload capability will all drive what planners will determine as necessary for adequate use. Furthermore, most countries rely heavily on their seaports as their economic line of communication. Therefore, military planners cannot expect that it will gain exclusive use of port facilities; thus, limiting

¹⁴⁵ Ibid.

¹⁴⁶ MG Edward L. LaFountain, Commander of Tanker Airlift Control Center, interviewed by John A Tirpak, May 2003, Air Force Magazine, Scott AFB, Illinois.

¹⁴⁷ See Appendix G. Bombay, India, in simulation, has a throughput capacity of 290 STONs/Day. Because of the enabling requirements of Port Opening Support Equipment to run the port of Nhava Sheva, the author decided to fly a bulk of the equipment into the nearest APOD (Bombay) which exceeded the throughput capacity by 200 + STONs, frustrating the TPFDDL by almost 15 x days.

throughput capacity. For example, in OIF the US military was limited to using primarily one port for offload operations. MSC was primarily limited to six ships at a time.¹⁴⁸ In simulation, the ports of Nhava Sheva and Karachi were only able to accommodate around 12,000 MTons per day (see Appendix G).¹⁴⁹ Kuwait is a relatively mature port facility due to its economic reliance on the export of natural resources from the region. Additionally, the necessary facilities, industries, and land transportation surrounding the ports are not as robust and capable as that of the ports in Kuwait.

In conclusion, the examples of OIF and the JFAST simulation demonstrate that poor infrastructure will delay the timely movement of cargo and personnel to an area of operation. Furthermore, as discussed in Chapter 2 of this monograph, the area of the globe that the US military will likely operate will not have facilities that either equate to or exceed the throughput capacities of CONUS or European ports of embarkation. US military programs for mitigating the infrastructure problem are worthy of their demands for funding. Although building up the fleet of airlift, sealift, or prepositioned sets of equipment is seemingly warranted based on the analysis conducted in the respective sub-sections of Chapter 3, infrastructure mitigation allows for the prudent expenditure of funds for Rapid Global Mobility programs. Therefore, it is recognized that mitigating the infrastructure in potential areas of operation is one of extreme importance and bears the funding, analysis, and study equal to that given to the Strategic Mobility Triad.

CHAPTER FOUR: CONCLUSIONS AND RECOMMENDATIONS

This paper has discussed, outlined, and examined the parameters of the simulation scenario, the force structure used in simulation, and four components for addressing the feasibility of re-deploying a heavy force package inter-theater from Kuwait to South Asia: Airlift, Sealift, APS-A, and Infrastructure. This simulation provided the data to illustrate and confirm the credibility of issues linked to strategic

¹⁴⁸ Brewer, Commander's Comments.

¹⁴⁹ The ports of Ash Shuaybah and Ash Shuwaykh were pushing between 20000 and 30000 MTons per day; whereas Nhava Sheva and Karachi were accepting only around 12000 MTons per Day.

mobility. Moreover, in the course of this monograph, five focus areas have emerged: a potential force structure for operations in Kashmir, airlift requirements and issues (feasibility), sealift requirements and issues (feasibility), prepositioning requirements and issues (feasibility), and infrastructure issues (feasibility). Therefore, this chapter will focus the conclusions and recommendations in each of these five focus areas, and then conclude with some final thoughts to address the stated hypothesis.

Informing Policy

Around 424 B.C., an Athenian General, Nicias, delivered an important argument to the Athenian democratic assembly over the potential use of force to invade distant Sicily. Nicias stated, "...this is no time for running risks or for grasping at a new empire before we have secured the one we have already."¹⁵⁰ Understanding the limitations of our strategic mobility system will enable the operational or strategic planner to accurately inform policy-makers. Also, it is important to examine a few of the strategic dynamics in South Asia to better inform policy-makers on a potential deployment's strengths and weaknesses. First, it is highly likely that the Global War on Terror will continue to vigorously make use of the strategic deployment system and that TRANSCOM will be stretched to ensure the timely movement of forces in support. Secondly, the lack of strategic infrastructure at both airfields and seaports will likely slow the tempo of any planned deployment to the region based on lack of available throughput. Current USTRANSCOM capabilities are not sufficient for enabling the PODs in South Asia to mirror the POEs of Kuwait or CONUS. Additionally, Kashmir straddles the dividing line between US Pacific Command (USPACOM) and US Central Command (USCENTCOM). Given that USCENTCOM is overseeing several operations from the Horn of Africa to Afghanistan, USPACOM may be called upon to lead a potential operation into South Asia. It is obvious that USPACOM is geographically challenged by distance, and sparse with its command presence in South Asia. Lastly, with a potentially tight decision timeline at the strategic level, transportation enablers will be challenged to make their respective link up

¹⁵⁰ Thucydides, *History of the Peloponnesian War*, trans. Rex Warner (London, England: Penguin Books, 1972), 415.

points with deploying troops at OCONUS POEs. Furthermore, it will require surging a large percentage of the strategic air fleet to meet a compressed timelines.

The situation in this region will remain fluid and uncertain. Moreover, consolidating the geographic gains that the United States has made in the past two years would be prudent to ensure future regional stability (i.e. diplomatic moves to forward base around the regions of instability). Furthermore, permanent basing in Kuwait and Qatar of two heavy divisions and an additional SBCT in the Horn of Africa or in Afghanistan would allow the US military the future flexibility required for contingencies in South Asia. Additionally, permanent-basing rights in Northwestern (NW) Australia of one to two heavy divisions would provide greater flexibility and regional access for potential contingency operations in South Asia. The concept of standing up permanent regional joint task force (JTF) headquarters within regional combatant commander AORs would alleviate the concern for assembling an ad-hoc command and control structure for such a contingency. For example, a standing joint task force headquarters for South Asia would be identified and forward based in NW Australia, Uzbekistan, or in Southwest (SW) Asia to provide adequate command and control for a potential crisis. Potentially, these headquarters could rotate onto surface command and control ships to provide more operational flexibility. On informing US policy, a re-deployment of troops from SW Asia to South Asia for peace-enforcement operations in Kashmir and India/Pakistan is feasible, but inefficient. Transportation components and enablers need time to reach their link up locations for the deploying forces. To ensure the efficiency of this process, POD enablers should be forward positioned (APS or forward-based). Ideally, the forward basing of US forces, closer to the proximity of these regions of instability, and creating new command and control structures would greatly reduce the timelines in a potential crisis.

Force Structure

Based on the research presented in Chapter Two, it is obvious that the Army, and the US military, is in need of re-structuring for faster deployability. Currently, the US 3d Infantry Division and the 101st

Air Assault Division are attempting to do such a thing. The re-structuring emphasis needs to analyze the idea of pushing the critical enablers of logistics, usually found in EAC and EAD, into the brigade combat teams (i.e. transportation enablers, water purification and development, and logistical reach-back capability). Increasingly, brigades and divisions are executing tasks that they are not properly organized to carry out. By having a standing joint task force, the necessary operational overhead will exist to allow the brigade command team to focus on tactical level tasks. The division serves as the force component headquarter, or a land component command element, and as an enabler for the brigade command teams. Most general support assets would be pushed down to the brigade teams because of the nature of stability operations. Thus, a deployment to South Asia is feasible but structurally inefficient.

Changes in force structure to streamline efficiencies for combat and deployment need to start at the highest levels. The US military needs to model USTRANSCOM like that of USSOCOM. It may be more advantageous for strategic deployment to give USTRANSCOM the ability to program a portion of its own budget through the Office of the Secretary of Defense (OSD). This would allow a consolidated effort towards making programs inherently joint, focused, and interoperable. Just as theater Special Operations Commands (SOCs) provide support for combatant commanders, Theater Transportation Commands would give a dimension of operational flexibility to the combatant commander; thus, reducing the strain on the strategic fleet. Furthermore, the 7th Transportation Group is not enough to provide for efficient deployments in a fluid strategic environment. These types of enablers need to be available regionally, so that the regional combatant commanders have some flexibility for shaping potential theaters of operation. Additionally, research needs to be conducted on the use and structure of US Army division general support assets. For example, disbanding the Main Support Battalions to push those assets into the Forward Support Battalions will allow more flexibility at the brigade level. As a result, the division could fulfill the traditional service component role with Title X coordination responsibility, or land component command, and logistical reach-back capability to the theater logistical element, the Defense Logistics Agency, or Army Material Command. Lastly, with the standing JTF concept, the utility of the Corps and

Army structure in the current operational environment is highly questionable. Increasingly, Corps and Division staffs are subsuming the role of JTF headquarters, which begs the question of relevance. Furthermore, research needs to be conducted as to the effectiveness of the theater support commands. By empowering the lower echelons with the traditional capabilities of echelons of higher support, there seems to be little need for several higher layers of command and control.

Airlift

Based on the research conducted, the use of air as a primary delivery means is feasible but highly inefficient. The only distinct advantages to utilizing air over sea are two-fold: it is faster and it can access remote areas. However, it has a lure to be the mode of choice because decision cycles are so tight that when an execution order is initiated, it seems that no other mode can meet the tight timelines. Decision cycles will only become tighter in an information age. Therefore, the central control of Air Mobility Command and the finite amount of strategic airlift assets is problematic. The theoretical hauling capacity is not commensurate with the reality of simple lack of necessary airframes. Furthermore, the CRAF program is a huge force multiplier but is not an indefinite source of assistance. In the United States, tying up the airline industry for long periods would be detrimental to the national economy. Lastly, the C17 aircraft, as the backbone for the strategic airlift fleet, is not being used to its maximum capability. The Short Take Off and Landing (STOL) capability allows it to access more remote locations for strategic deliveries, but the central control limits operational commanders from executing dynamic operational maneuvers in the wake of strategic demands.

Our current airlift technologies and capabilities can be maximized through executing a force structure study of AMC and through purchasing more C17 aircraft. Since the C5B has a longer range and is more fuel efficient with outsized cargo, there is definite value in the current modernization program as budgeted through 2006. Furthermore, an increase in the purchase of C17 aircraft for the strategic fleet is warranted. GEN Handy's request for 222 total C17 aircraft would allow a greatly improved flexibility to

the strategic air hauling capacity. However, one theater squadron of C17 aircraft needs to be activated to directly support each regional combatant commander. Forward basing would reduce the deployment times and compliment a compressed strategic decision cycle. Potential bed-down sites for these elements and squadrons would be in Qatar, Guam, Germany or Italy, Alaska, Romania, Poland, NW Australia, and Florida. Lastly, with USTRANSCOM re-structured into an organization similar to USSOCOM, the onus of financial responsibility for support could be shared between USTRANSCOM funds and USAF service funds.

Sealift

Sealift is a feasible method for strategic deployment, but not responsive and costly in its current construct. Being small in its market share of the international shipping industry, US flagships simply are not reliable or adequate for responsive and rapid deployment. The Ready Reserve Fleet is very costly to maintain, but provides the necessary workhorse in times of crisis. Furthermore, the relationship between MSC and the US Department of Transportation/MARAD is not responsive enough and bureaucratic. Although this relationship has improved during the current war on terror, the locations and types of commercial ships are unpredictable and, therefore, not responsive enough for rapid deployment. It is also evident that inter-modal transportation is the most efficient method of transporting goods overseas. Therefore, our reliance (as a nation) on the foreign shipping industry will only increase. Lastly, it is obvious that military hardware and equipment requires special, and sometimes older, ship types, as tanks and infantry carriers were not designed for inter-modal strategic movement.

Based on the analysis of time versus mode/source for achieving rapid global mobility, forward naval shipping ports need to accompany any forward bases around the arc of instability. For instance, the proposal for permanent forward basing in Australia, Qatar, Kuwait, Italy or the Balkans, Romania, Poland, and Guam bears research and analysis for the development of adjacent naval ports. These ports would facilitate the rapid deployment via surface. Furthermore, ships could be staffed with US officers

and manned with indigenous crews; thus, alleviating high crew costs. The regulations and licenses required of fully manned US crews could be waved in certain instances; therefore, alleviating the burden of sometimes overly stringent regulations. However, this program would work well as it would invest in the economic health of the host nation by providing stable careers with tangible benefits. Forward deploying a percentage of the ships currently in ROS status could support this program proposal. Additionally, regional contracting authorities would allow for the theater transportation command of a regional combatant command to utilize local shipping and, therefore, take advantage of the international inter-modal shipping industry. Moreover, more analysis is required for determining the use of the Theater Support Vessels (TSVs) from a Joint perspective at the theater level. Just as the proposal for new C17 squadrons was presented, so is the proposal to forward base at least one shipping squadron of TSV assets to facilitate faster surface maneuver within a theater. Lastly, USTRANSCOM would share the same relationship with the regional combatant commander's sea mobility element of the Theater Transportation Command as USSOCOM shares with the current Theater SOC's.

Prepositioning

Prepositioning seems to be the most feasible method for supporting regional deployments. Although there are challenges at the unit level, it is strategically and operationally flexible (especially afloat sets). Obviously, with the evolution of OIF, it is not currently feasible, and therefore the decisions on what the ARF and APS sets will be comprised and their potential locations are risky and extremely important. The presence of robust prepositioned sets of equipment certainly alleviates the burden on USTRANSCOM for providing strategic hauling capability for heavy equipment sets. However, with large numbers of prepositioned sets of equipment comes the huge burden of maintaining and updating the systems. Furthermore, anticipating land-based bed-down locations is difficult due to the fluid operational environment. As a result, the ARFs seem more attractive because of increased flexibility and limited 'footprints.'

Deductive logic leads one to believe that the heavier the force, the more forward based it should be to execute a more rapid force deployment. This obviously bears more research, but essentially, it means that heavy forces would primarily be forward deployed (i.e. Qatar, Kuwait, Australia, Romania, Poland, and Alaska). Additionally, Stryker Brigades could be forward based in the Horn of Africa, the Balkans, Italy or Germany, Afghanistan, Uzbekistan, and Hawaii. Furthermore, with the forward basing of Army units, airlift elements/squadrons, and sealift assets, there would be little need to preposition the divisional and brigade level equipment. Therefore, the preponderance of ARF equipment would be the enabling packages necessary to build the support infrastructure and sustainment packages necessary for a deployment (i.e. Port Opening Support Equipment, Arrival/Departure Airfield Control Group Equipment – A/DACG, and Days of supply across the classes). As a result, the lighter units will be closer to CONUS; therefore, the 82d Airborne Division, the 10th Mountain Division, and the 25th Infantry Division would be CONUS-based, while the heavier units would be regionally positioned. Lastly, all units could train and plan for deployment with their organic equipment because of the proximity to the potential operational areas; thus, relieving the need for multiple sets of additional equipment sets.

Infrastructure

As this research indicates, infrastructure is the leading culprit to our ability to access places globally in a rapid fashion. The nature of future operational areas is one of economic misfortune, which translates into limited access to/use of strategic lines of communication (South Korea being the exception). Therefore, the port infrastructure is limited and not readily available. Consequently, the US simply cannot throw structural investments into areas of regional instability in the hope of gaining ready access. Furthermore, the infrastructure needed goes beyond simple offload of bulk and general cargo. Obviously, the sensitivities and complexities to gaining access for hazardous materials/ammunition and petroleum bear significant innovations for future deployments. Offshore pipelines and logistics over the shore are emerging technologies that could prove invaluable to a deploying force in the near future.

However, weather/sea states and interoperability plague the innovation process. Lack of interoperability is simply due to a lack of focus at the joint level because of service agendas or inadequate funding/interest. Again, a 'USSOCOM-like' relationship with OSD might assist in the interoperability issues and enhance the military's ability to globally project force. The issue of weather and sea-state is a solution in the 'works.' With focus, time, and proper funding, military researchers and industry can solve this issue. Commercial oil platforms operate daily in some of the roughest seas in the world and are able to extract their resource and transport it safely back to shore for consumption. Additionally, most of the transportation enablers are not responsive. For example, large percentages of enablers are in the reserve component of our US armed forces and, therefore, require a significant amount of time to mobilize and deploy.

Joint funding and international cooperatives would provide an integral transportation network that allows for a more efficient deployment scenario. Again, USTRANSCOM needs to enjoy the same status as that of USSOCOM, and then the infrastructure situation would be well on its way to being solved. Regional funding and support for the TSV program, the Joint Logistics-Over-the-Shore (J-LOTS), programs for In-Transit Visibility (ITV), and Global Transportation Assessment Teams would greatly enhance our ability to develop solutions for infrastructure challenges. Additionally, investments in the forward placement and development of TALCE and A/DACG units, Port Opening Support Packages, and interoperable computer networks establishing information networks would greatly enable regional combatant commanders to provide flexible and rapid options. Lastly, these programs have to be interoperable, which simply means that service agendas and budgets need to be less of an issue. For example, lighterage for J-LOTS is different for both the Navy and the Army, but the program is supposed to be Joint. Without adequate joint funding, these programs will be subject to the interests of the individual services, only receiving the necessary attention when it suits the component. In conclusion, infrastructure is the one component that bears the most analysis, funding, and scientific research, as it is the most challenging to overcome.

Final Thoughts

Finishing this research has led to an obvious set of conclusions and recommendations. Some of these recommendations may be outside the realm of the possible for the moment. However, the concept is to provide some unconstrained ideas based on the reality of globalization and the requirement to remain globally engaged. Obviously, shifting of forward bases requires host nation agreements and basing rights, but forward engagement is what ensures the security of the civilized world. Furthermore, the world is a large place, not easily transited by large deliveries of military equipment. Based on the presented evidence, this monograph advocates the need for standing Joint Task Force headquarters under combatant commands focused on potential problem regions. Therefore, USTRANSCOM must be elevated to the level of importance that USSOCOM enjoys with the Department of Defense and Congress. An Assistant Secretary of Defense for Strategic Transportation and programmed funding for USTRANSCOM is critical to supporting joint transportation programs. Representing USTRANSCOM in combatant command would be the regional Transportation Commands to coordinate all operational/theater transportation requirements associated (e.g. TRANSEUR – Transportation Command – Europe). Secondly, a new mobility requirements study is needed to adequately determine the amount of strategic lift required. The current operating environment is too demanding on the strategic transportation fleet programmed in the MRS that accompanied the QDR-2001. Third, the modernization program for the C5B needs to continue and an increase in the strategic C17 fleet is most necessary. The Ready Reserve Fleet needs to continue being adequately funded and readily available. Fourth, this study also recommends the need for additional C17 and TSV squadrons forward-based in direct support of critical regional combatant commands (i.e. PACOM, CENTCOM, and EUCOM). Regional commands must have the authority and capability to contract local shipping for delivery of forward-deployed forces. Additionally, prepositioned sets of equipment must contain heavy sets of infrastructure enablers to build up potential JOAs. Lastly, heavy units in the Army should be forward based around the regions of

instability to ensure timely movement to potential crisis areas (i.e. units in NW Australia, Qatar, and Kuwait).

When the potential for war existed in Europe, the US military ‘forward-based’ units and necessary assets to meet the Soviet threat; now it is necessary to meet the threats of a new operational environment. Similarly, if the contemporary operational environment has shifted drastically from the days of the Cold War, then the US military should develop our strategic plans/structures with foresight and a realistic expectation. These same military assets and forces, pushed forward around the potential regions of instability, resourced and empowered at the lowest levels, and enabled by a robust deployment and transportation network will ensure the strategic mobility needed for deployments to future problem areas. In conclusion, and based on the research conducted for this monograph, re-deploying a US Army heavy force package inter-theater from Kuwait to India/Pakistan is feasible, but inefficient.

APPENDIX A (Glossary of Terms)

463L Pallet: An 88" x 108" aluminum flat base used to facilitate the upload and download of aircraft (JP 1-02).

9/11/01: 11 SEPT 2001; the day the Pentagon and World Trade Centers were attacked.

Acceptable: Operation plan review criterion. The determination as to whether the contemplated course of action is worth the cost in manpower, materiel, and time involved; is consistent with the law of war; and is militarily and politically supportable (JP 1-02).

Ahzad-Kashmir: 'Free Kashmir;' The Pakistani controlled portion of the disputed Kashmir region.

ALD: A date specified for each unit in a time-phased force and deployment data indicating when that unit will be ready to load at the point of embarkation (JP 1-02).

Assure: To inform confidently; with a view of removing doubt (The American Heritage Dictionary).

CEGE: Combat Equipment Group Europe; oversees the prepositioned stocks in Europe.

COE: Contemporary Operational Environment.

Coercion: Seeks to affect the behavior of an opponent by manipulating costs and benefits; involves persuading an opponent to stop an ongoing action or to start a new course of action by changing its calculations of costs and benefits (Pape, 12).

C2: The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission (JP 1-02).

C4I: Command, Control, Communications, Computers, and Intelligence; Integrated systems of doctrine, procedures, organizational structures, personnel, equipment, facilities, and communications designed to support a commander's exercise of command and control across the range of military operations (JP 1-02).

CRAF: A program in which the Department of Defense contracts for the services of specific aircraft, owned by a US entity or citizen, during national emergencies and defense-oriented situations when expanded civil augmentation of military airlift activity is required. These aircraft are allocated, in accordance with Department of Defense requirements, to segments, according to their capabilities, such as international long range and short range cargo and passenger sections, national (domestic and Alaskan sections) and aeromedical evacuation and other segments as may be mutually agreed upon by the Department of Defense and the Department of Transportation (JP 1-02).

CRD: The original date relative to C-day, specified by the combatant commander for arrival of forces or cargo at the destination; shown in the time-phased force and deployment data to assess the impact of later arrival (JP 1-02).

Defeat: a tactical mission task that occurs when an enemy force has temporarily or permanently lost the physical means or the will to fight (FM 3-90).

Deny (Denial Measure): An action to hinder or deny the enemy the use of space, personnel, or facilities. It may include destruction, removal, contamination, or erection of obstructions (JP 1-02).

Deter: The prevention from action by fear of the consequences. Deterrence is a state of mind brought about by the existence of a credible threat of unacceptable counteraction (JP 1-02).

Destroy (ed): A condition of a target so damaged that it can neither function as intended nor be restored to a usable condition. In the case of a building, all vertical supports and spanning members are damaged to such an extent that nothing is salvageable. In the case of bridges, all spans must have dropped and all piers must require replacement (JP 1-02).

Disrupt: a tactical mission task in which a commander integrates direct and indirect fires, terrain, and obstacles to upset an enemy's formation or tempo, interrupt his timetable, or cause his forces to commit prematurely or attack in a piecemeal fashion (FM 3-90).

Dissuade: To discourage or deter from a purpose or course of action by persuasion or exhortation (The American Heritage Dictionary).

EAD: A day, relative to C-day, that is specified by a planner as the earliest date when a unit, a resupply shipment, or replacement personnel can be accepted at a port of debarkation during a deployment. Used with the latest arrival data, it defines a delivery window for transportation planning (JP 1-02).

Employment: The strategic, operational, or tactical use of forces (JP 1-02).

Feasible: Operation plan review criterion. The determination as to whether the assigned tasks could be accomplished by using available resources (JP 1-02).

Flexible Deterrent Option: A planning construct intended to facilitate early decision by laying out a wide range of interrelated response paths that begin with deterrent-oriented options carefully tailored to send the right signal. The flexible deterrent option is the means by which the various deterrent options available to a commander (such as economic, diplomatic, political, and military measures) are implemented into the planning process (JP 1-02).

FMTV: Family of Military Tactical Vehicles; New military ground transport truck.

Global War on Terror: The US official war against international terrorist organizations.

ISI: Pakistan's secret intelligence service.

Jammu-Kashmir: The Indian Controlled portion of the Kashmir region.

JFAST: Joint Flow and Analysis System for Transportation; simulation planning tool for determining feasibility of transportation and sustainment of forces.

JTF: A joint force that is constituted and so designated by the Secretary of Defense, a combatant commander, a subunified commander, or an existing joint task force commander (JP 1-02).

LAD: A day, relative to C-Day, that is specified by the supported combatant commander as the latest date when a unit, a resupply shipment, or replacement personnel can arrive at the port of debarkation and support the concept of operations. Used with the earliest arrival date, it defines a delivery window for transportation planning (JP 1-02).

Lighterage: A small craft designed to transport cargo or personnel from ship to shore. Lighterage includes amphibians, landing craft, discharge lighters, causeways, and barges (JP 1-02).

Millions of ton-miles per day (MTM/D): The standard unit of measure of theoretical airlift capacity. “For example, 36 MTM/D is the capacity to move 6,000 tons of cargo over 6,000 nautical miles in one day.” (Scott F. Smith, 46)

MOG: An average measure of the number of planes that a particular airfield can service at any given time. It reflects both the physical limitations of an airfield (ramp space, refueling capabilities, load/unloading equipment) and the competition for its use (i.e. civilian and/or host nation use). Airfields generally have two MOG figures: 1) Reflects in/out capability, such as how many aircraft can land, load/unload, refuel, and depart at a time and 2) Reflects overall capacity of the field, as in how many aircraft can be parked on the ramp for periods of time. It is important to remember that MOG is a flexible figure. That is, adding a Global Reach Laydown Package (GRL) of personnel and materials handling equipment (MHE) to a field can increase the MOG. Additionally, “creative” ramp usage can, in times of dire need, increase the MOG. For example, it is often possible to park aircraft on taxiways or other non-ramp areas. (Scott F. Smith, 46)

Non-Air Transportable: That which is not transportable by air by virtue of dimension, weight, or special characteristics or restrictions (JP 1-02).

Operation Desert Storm: Offensive Actions from Jan – Feb 1991 to eject the Iraqi military from the sovereign country of Kuwait.

Operation Enduring Freedom: Ongoing operation in direct support of the US Global War on Terror.

Operation Iraqi Freedom: Ongoing operation to oust the Baathist Iraqi regime and establish a democratic nation-state within the sovereign borders of Iraq.

Operational Level of War: The level of war at which campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or other operational areas. Activities at this level link tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain these events. These activities imply a broader dimension of time or space than do tactics; they ensure the logistic and administrative support of tactical forces, and provide the means by which tactical successes are exploited to achieve strategic objectives (JP 1-02).

Outsized Cargo: Cargo that exceeds the dimensions of oversized cargo and requires the use of a C-5 or C-17 aircraft or surface transportation. A single item that exceeds 1,000 inches long by 117 inches wide by 105 inches high in any one dimension (JP 1-02).

Oversized Cargo: 1. Large items of specific equipment such as a barge, side loadable warping tug, causeway section, powered, or causeway section, nonpowered. Requires transport by sea. 2. Air cargo

exceeding the usable dimension of a 463L pallet loaded to the design height of 96 inches, but equal to or less than 1,000 inches in length, 117 inches in width, and 105 inches in height. This cargo is air transportable on the C-5, C-17, C-141, C-130, KC-10 and most civilian contract cargo carriers (JP 1-02).

PAX: Refers to deploying personnel.

POD: Port of Debarkation.

POE: Port of Embarkation.

Preemption: Acquisition or appropriation of something beforehand. Preemptive = designating of characteristic of a bid that is unnecessarily high, and is intended to prevent the opposing players from bidding (The American Heritage Dictionary).

QDR 2001: Quadrennial Defense Review Report September 2001. Defines the contemporary operational environment for the military planner. Also, provides a vision for military future progress.

Rapid Global Mobility: The timely movement, positioning, and sustainment of military forces and capabilities across the range of military operations (JP 1-02).

RRF: A force composed of ships acquired by the Maritime Administration (MARAD) with Navy funding and newer ships acquired by the MARAD for the National Defense Reserve Fleet (NDRF). Although part of the NDRF, ships of the Ready Reserve Force are maintained in a higher state of readiness and can be made available without mobilization or congressionally declared state of emergency (JP 1-02).

Stability Operation: Operations that promote and protect US national interests by influencing the threat, political, and information dimensions of the operational environment through a combination of peacetime developmental, cooperative activities and coercive actions in response to crisis (FM 1-02).

STOL: The ability of an aircraft to clear a 50-foot (15 meters) obstacle within 1,500 feet (450 meters) of commencing takeoff or in landing, to stop within 1,500 feet (450 meters) after passing over a 50-foot (15 meters) obstacle (JP 1-02).

Strategic Level of War: The level of war at which a nation, often as a member of a group of nations, determines national or multinational (alliance or coalition) security objectives and guidance, and develops and uses national resources to accomplish these objectives. Activities at this level establish national and multinational military objectives; sequence initiatives; define limits and assess risks for the use of military and other instruments of national power; develop global plans or theater war plans to achieve these objectives; and provide military forces and other capabilities in accordance with strategic plans (JP 1-02).

Strategic Maneuver: “The ability to project military power rapidly from all points of the globe to converge simultaneously with overwhelming land, air, space, and maritime forces that paralyze and dominate the enemy.” (Army Science Board, 1999)

Strategic Mobility: The capability to deploy and sustain military forces worldwide in support of national strategy (JP 1-02).

Sustainment: The provision of personnel, logistic, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or of the national objective (JP 1-02).

Tactical Level of War: The level of war at which battles and engagements are planned and executed to accomplish military objectives assigned to tactical units or task forces. Activities at this level focus on the ordered arrangement and maneuver of combat elements in relation to each other and to the enemy to achieve combat objectives (JP 1-02).

TALCE: Tanker Airlift Control Element.

Theoretical capacity: A measure of what, in theory, airlift planes could carry when mobilized. This is calculated using average measures of each plane's performance (average payloads and reliability rates). It provides more realism for planners than attempting to coordinate airlift on "paper" capabilities. For example, although the C-5 is technically able to carry 290,000 pounds, experience has proven that the aircraft often "cubes-out" (runs out of space) before its maximum load weight is reached. Thus, planners use a theoretical capacity figure of approximately 125,000 pounds. Also added in this figure is a historical consideration of reliability. Planners consider the mission capable rate of the aircraft type as cargo capability is derived. This is perhaps the most critical aspect of airlift calculation, for it grounds planning in reality. An example is illustrative: If in planning for a contingency response one considered employing 10 C-5s at theoretical capacity over a 24-hour period, and did not include compensating for the aircraft's 60 percent mission reliability rate, the deadline would undoubtedly be missed. Finally, it is important for the reader to consider that theoretical capacity *does not* include constraints that may be experienced in deployment (airfield limitations, etc). As a result, actual airlift deliveries tend to be even lower than theoretical capacity. (Scott F. Smith, 46).

Throughput: The average quantity of cargo and passengers that can pass through a port on a daily basis from arrival at the port to loading onto a ship or plane, or from the discharge from a ship or plane to the exit (clearance) from the port complex. Throughput is usually expressed in measurement tons, short tons, or passengers. Reception and storage limitation may affect final throughput (JP 1-02).

Tons: The standard unit of weight measure for airlift cargo. "Specifically, airlift uses "short tons" (S/TNS = 2,000 pounds) as a common term. The physical dimension or shape of cargo may preclude its movement on certain aircraft despite meeting the craft's weight limitations. (Normally, this is a reference to "out" and "over-sized" cargo which can only be moved by certain aircraft. For example, M1A2 Abrams tanks or AH-64D Apache helicopters only "fit" in C-5s or C-17s despite weighing less than a KC-10's maximum cargo load)." (Scott F. Smith, 46)

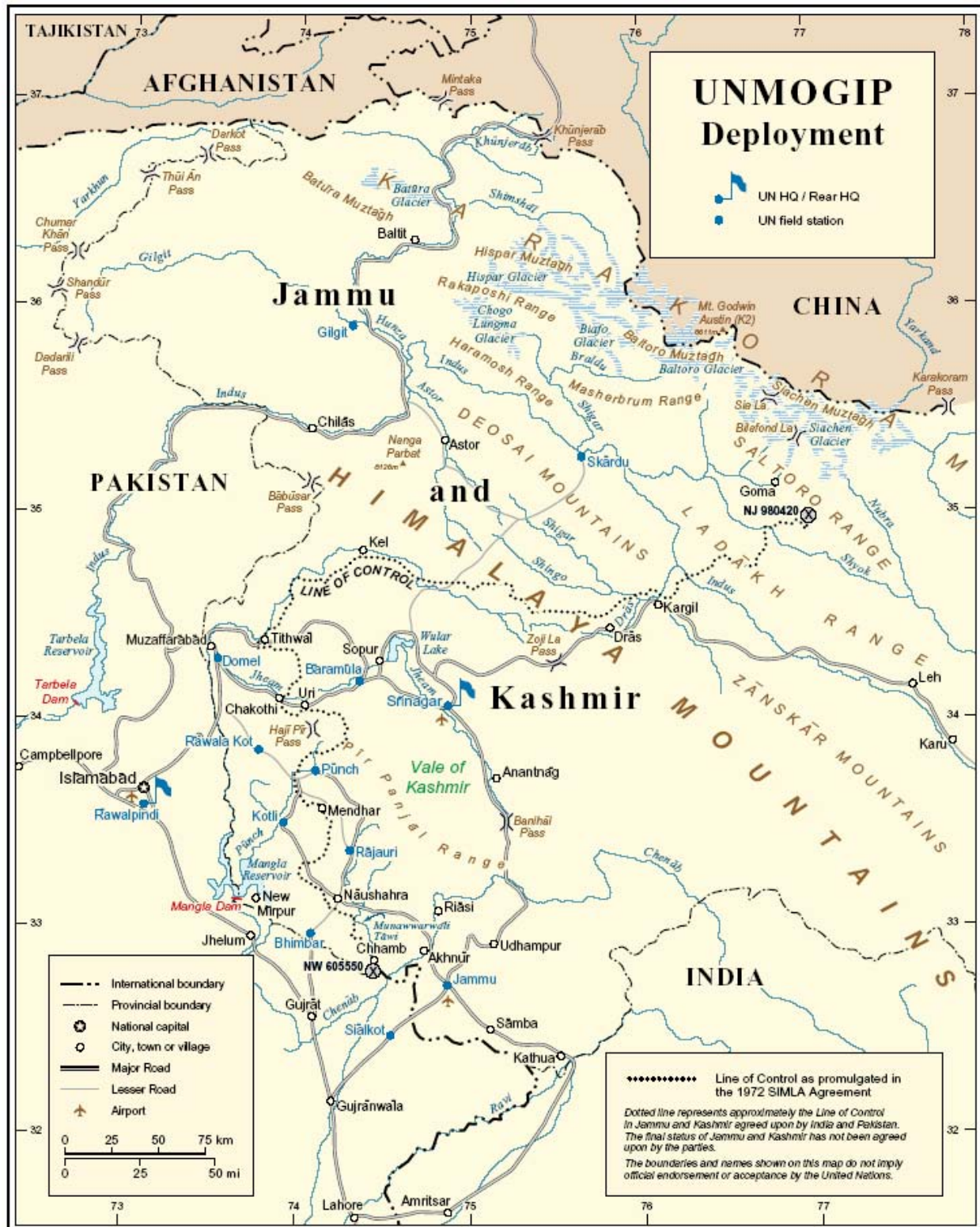
Ton-Miles: A unit of measure that includes both the weight of the cargo and the distance it must be carried. "For example, airlifting a 2-ton truck the 5,500 nautical miles from Travis AFB, California to Aviano, Italy would amount to a workload of 11,000 ton-miles." (Scott F. Smith, 46)

Trans-shipment: Referred by the author as the point at where cargo and personnel are transferred from a C5 or commercial aircraft to a C17 or C130 because of accessibility issues.

UCP: The document, approved by the President, that sets forth basic guidance to all unified combatant commanders; establishes their missions, responsibilities, and force structure; delineates the general geographical area of responsibility for geographic combatant commanders; and specifies functional responsibilities for functional combatant commanders (JP 1-02).

UNMOGIP: United Nations Mission Observer Group India/Pakistan.

APPENDIX B (Disposition of UNMOGIP)



APPENDIX C (Air Mobility Command)

Air Mobility Command (AMC) is the Transportation Component Command (TCC) for Airlift at Scott AFB in Illinois (located next to the US Transportation Command). By design, the USTRANSCOM commander is also the AMC commander. The primary components of the Air Mobility Command are the regular airlift fleet, contracted air carriers, and the Civil Reserve Air Fleet (CRAF). CRAF is a program, which financially supplements the carriers in peace, but, when activated, demands a portion of the US carrier fleet to participate in the deployment and sustainment of military operations. It has three stages: stage one (Committed Expansion) is executed by CINCTRANSCOM, stage two (Defense Airlift Emergency) is executed by the Secretary of Defense (SECDEF), and stage three (National Emergency) is executed by the SECDEF with approval from the President of the United States (POTUS) and congress.¹⁵¹ The “Fly America” Act reserves all business for US airlines, requiring that any airline bidding on routes for participation must enroll 30 percent of its fleet into the program.¹⁵² “When DOD activates the Civil Reserve Air Fleet, it can provide over 50 percent of DOD's strategic airlift requirements.¹⁵³ During Desert Storm and OIF, CRAF was activated up to stage two and stage one respectively.¹⁵⁴

¹⁵¹ Joint Publication 4-01, *Joint Doctrine for the Defense Transportation System*, 19 March 2003, III-4.

¹⁵² Scott F. Smith.

¹⁵³ USTRANSCOM, Annual Command Report, 4.

¹⁵⁴ “Reserve Airfleet Call-Up Ending,” *Air Force News Release*, June 2003, n.p., on-line internet, 12 June 2003, available from <http://www.af.mil/stories/123005060.shtml>.

APPENDIX D (Military Sealift Command)

Military Sealift Command is the maritime transportation component command for USTRANSCOM. It draws from the following pools for support in sealift operations: US chartered flagships (sustainment), Prepositioned ships (Contingency), Fast Sealift Ships (Contingency), Contracted space on US ships (sustainment), Foreign flag charters (sustainment), the Ready Reserve Fleet (contingency/sustainment), and ship requisitioning.¹⁵⁵ Of this, there are four sets of government controlled contingency assets: Ships in the Afloat Prepositioning Force, MSC's Fast Sealift Ships (8 x FSS), The Large Medium Roll-On and Roll-Off (19 x RO/RO) ships, and the Ready Reserve Fleet (RRF). MSC works with the Department of Transportation (DOT), and the Maritime Administration (MARAD), to ensure a capable merchant marine fleet.¹⁵⁶

Recognizing the intermodal (between modes of transportation) nature of the global shipping transportation system, the US government enacted the 1996 Maritime Security Act and the Voluntary Intermodal Security Agreement (VISA) to take advantage of the system and provide incentives to US flag carriers to support the DOD. Like CRAF, VISA provides financial incentives in times of peace to ensure sealift support for times of war. VISA is a new initiative to make commercial, intermodal, dry cargo capacity and supporting global infrastructure available to meet contingency requirements.¹⁵⁷ All major US flag carriers are enrolled in VISA. This constitutes more than 90 percent of the US flag dry cargo fleet. The worldwide intermodal system provided by these carriers provides extensive and flexible capabilities.¹⁵⁸ This program allows MSC to provide wide ranges of shipping options to the DOD.¹⁵⁹

¹⁵⁵ Laches, 3.

¹⁵⁶ Joint Publication 4-01, III-6.

¹⁵⁷ Bradley E. Smith, 5.

¹⁵⁸ Joint Publication 4-01, III-6.

¹⁵⁹ James Blake, "Sense and Response Logistics Capabilities and Operation Iraqi Freedom," *Science Applications International Corporation*, Summer – Fall 2003, n.p., on-line, Internet, 13.

APPENDIX E (Military Prepositioning Program)

“Army war reserves (AWR) and pre-positioned stocks are managed by the Army Materiel Command (AMC), Alexandria, Virginia, with the Army Industrial Operations Command (IOC), Rock Island, Illinois, serving as AMC's management agent.”¹⁶⁰ “What was formerly war reserves and POMCUS [pre-positioning of materiel configured to unit sets] stocks are now combined into AWR stocks.”¹⁶¹

“AWR-1 are stocks in the continental United States; AWR-2 are the European stocks that fall under Combat Equipment Group Europe (CEGE); AWR-3 will contain two brigades-worth of materiel eventually that will be stored aboard 16 ships (along with 30 days of supply, a theater opening sustainment and support package of equipment and supplies); AWR-4 is in Japan and Korea to support the Pacific theater; AWR-5 is located in Southwest Asia, and consists of two brigade-sets of material-one stored in Kuwait and the other stored in Qatar.”¹⁶² “Pre-positioned cargoes aboard APF shipping include the capability to provide humanitarian assistance with food rations, medical supplies, habitability sets (i.e., tents), potable water-making machinery, engineer support equipment, and motor transport.”¹⁶³

“Afloat Prepositioning Force, known as prepositioning ships, consist of LASH (Lighter Aboard Ship) barge-carrying ships, breakbulk ships, tankers and one semi-submersible heavy lift ship.”¹⁶⁴ Also, the new Large Medium Roll On/Roll Off Ships are the back-bone of the prepositioned fleet. “The [1992 Mobility Requirments Study] study recommended that DOD acquire 20 LMSR ships, 9 for prepositioning, and 11 for surge to meet this requirement.”¹⁶⁵ “These prepositioning ships have been designed to provide a better controlled-humidity environment below deck, which should help reduce the deterioration of equipment

¹⁶⁰ “Strategic Sealift,” *MSC Fact Sheet*.

¹⁶¹ Ibid.

¹⁶² Ibid.

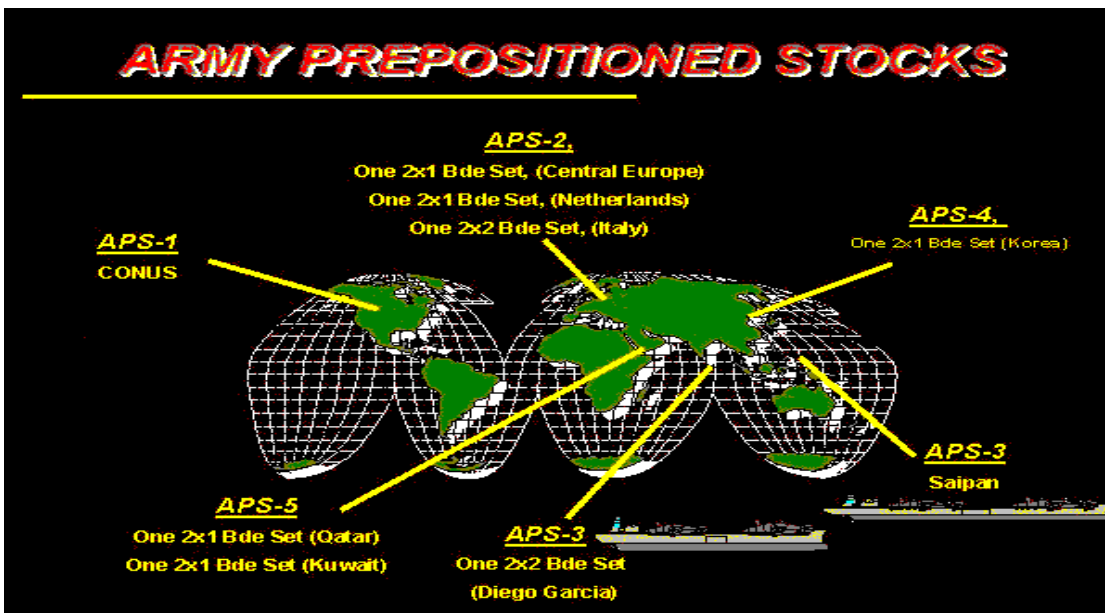
¹⁶³ Ibid.

¹⁶⁴ Ibid.

¹⁶⁵ “Sealift,” *FAS*.

while stored aboard the ships.”¹⁶⁶ Before OIF, “MSC's Prepositioning Program had 42 ships, including 40 that usually operate in the Mediterranean Sea, Diego Garcia in the Indian Ocean and Guam/Saipan in the western Pacific Ocean.”¹⁶⁷

“The Military Sealift Command (MSC) Prepositioning Program provides operationally ready ships to the military services and the Defense Logistics Agency. At the end of 1999, MSC's Afloat Prepositioning Force consisted of 37 ships, with 35 operating at prepositioning sites in the Mediterranean Sea, Diego Garcia in the Indian Ocean and Guam in the western Pacific.”¹⁶⁸ There are three components to the Prepositioning program: Maritime Prepositioning Ships (MPS) for the USMC, Combat Prepositioning Ships for the U.S. Army (a component of the 1993 DOD approved Army Global Positioning Strategy), and Logistics Prepositioning Ships for the Navy/Air Force/DLA.



Disposition of APS before OIF¹⁶⁹

¹⁶⁶ Ibid.

¹⁶⁷ “Afloat Prepositioning: The Key to US Warfighters’ Rapid Response,” *Naval News Service* Press Release, 28 March 2003, n.p., on-line, Internet, 29 December 2003, available from <http://www.msc.navy.mil>.

¹⁶⁸ “Sealift,” *FAS*.

¹⁶⁹ “Sealift,” *FAS*.

APPENDIX F (Infrastructure Responsibilities)

“As outlined in the Unified Command Plan, USTRANSCOM has the mission to provide worldwide common-user aerial and seaport terminal management and may provide terminal services by contract. Thus USTRANSCOM, through AMC and MTMC [SDDC], will manage common-use aerial ports and seaports for the geographic combatant commander.”¹⁷⁰ USTRANSCOM is the DOD’s Distribution Process Owner and uses the newly named Surface Deployment and Distribution Command (formerly Military Traffic and Management Command; now SDDC) to accomplish this mission. “As USTRANSCOM’s surface TCC, MTMC [SDDC] performs... [terminal] functions necessary to support the strategic flow of the deploying forces’ equipment and sustainment supply in the SPOE and hand-off to the geographic combatant commander in the SPOD.”¹⁷¹ Because of the recent global commitments on the war on terror, MTMC, USTRANSCOM’s Transportation Component Command for Land surface operations, will be officially renamed to the (Military) Surface Deployment and Distribution Command (SDDC).¹⁷²

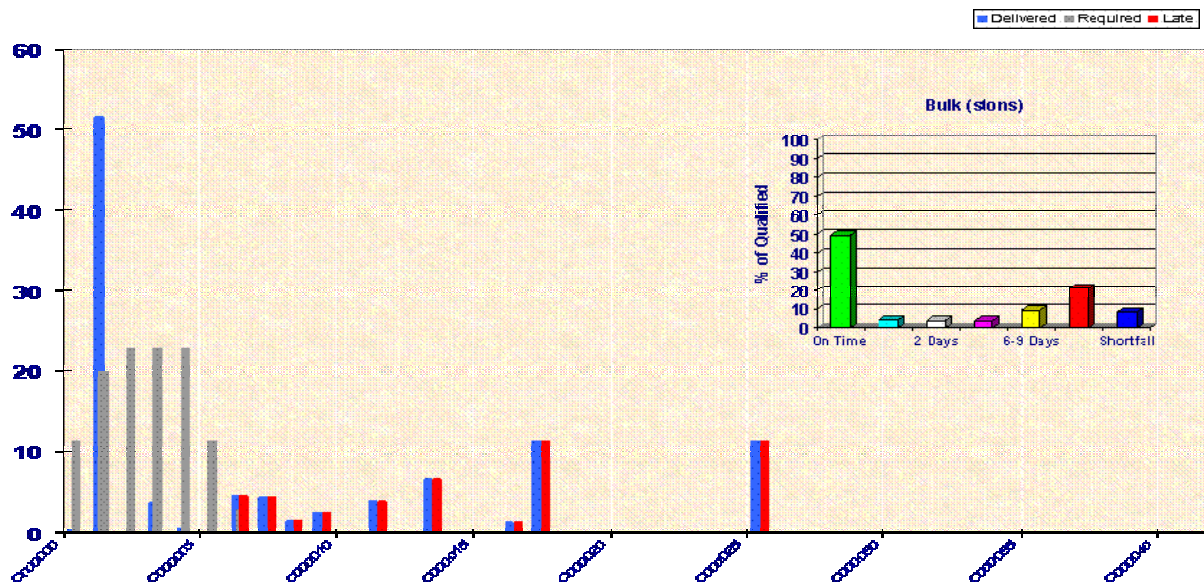
¹⁷⁰ Joint Publication 4-01, III-13.

¹⁷¹ Ibid, III-13.

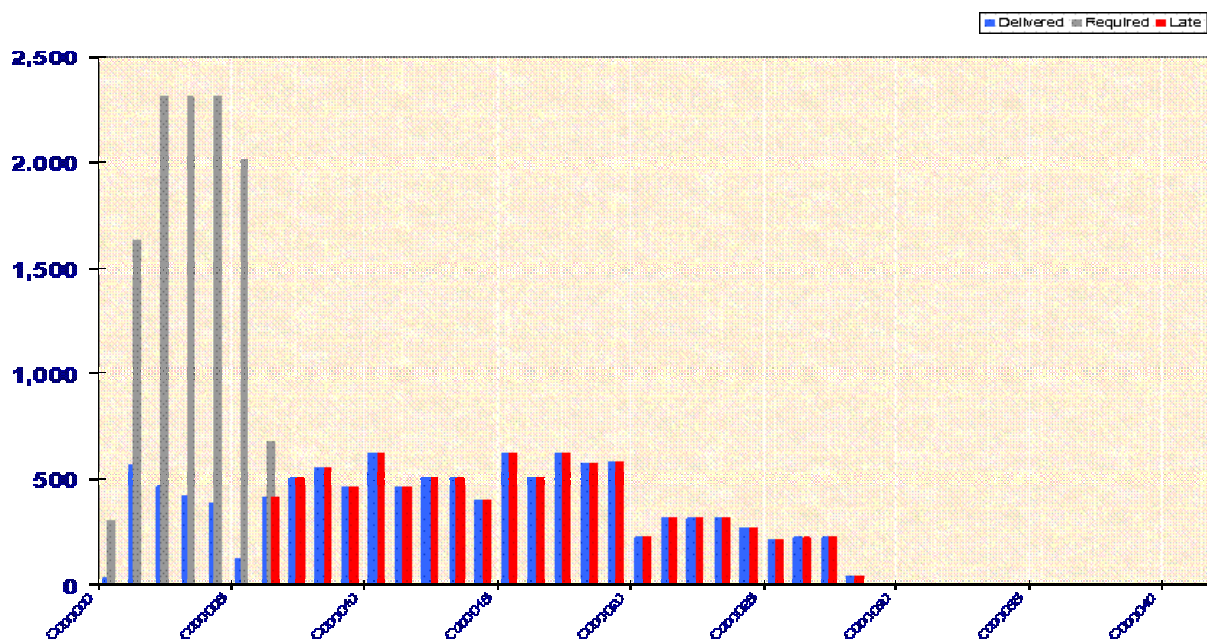
¹⁷² “Focused Support to the Warfighter Captured in Major Army Command Name Change...,” *MTMC News Release*, 17 October 2003, n.p., on-line, Internet, 29 December 2003, available from <http://www.mtmc.army.mil/frontDoor/0,1865,OID=1-10139----,00.html>.

APPENDIX G (Simulation Statistics)

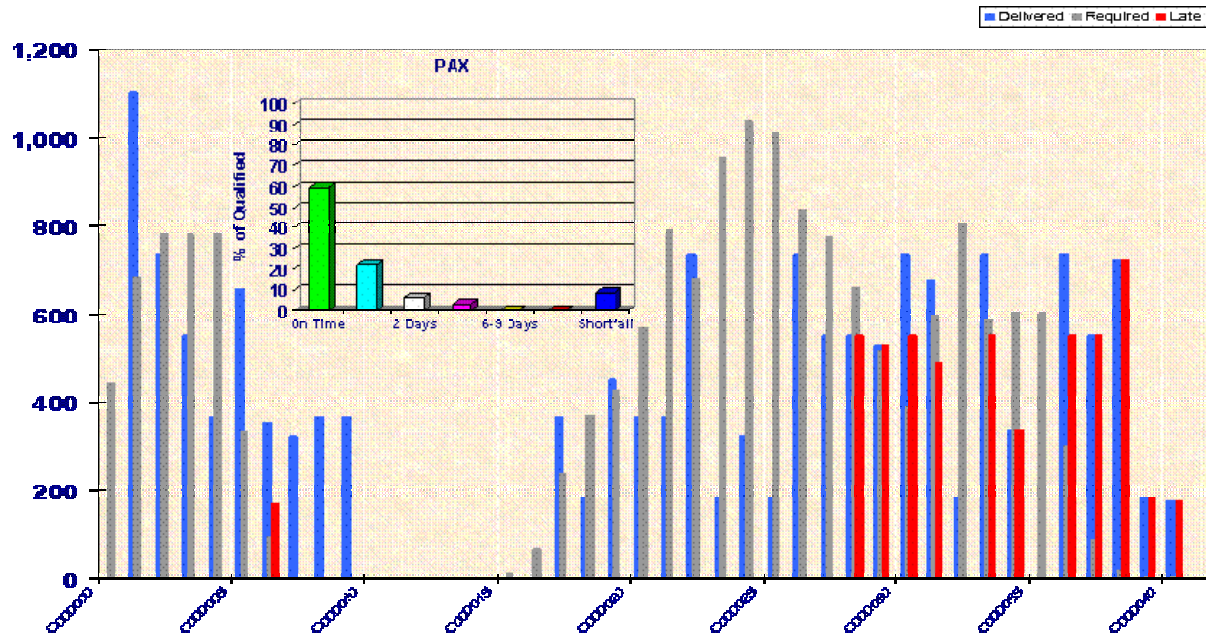
Airlift Bulk by Day (stons)



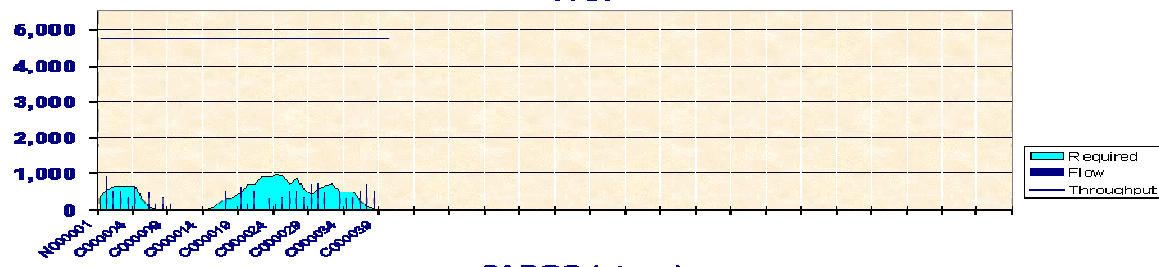
Airlift Over & Out by Day (stons)



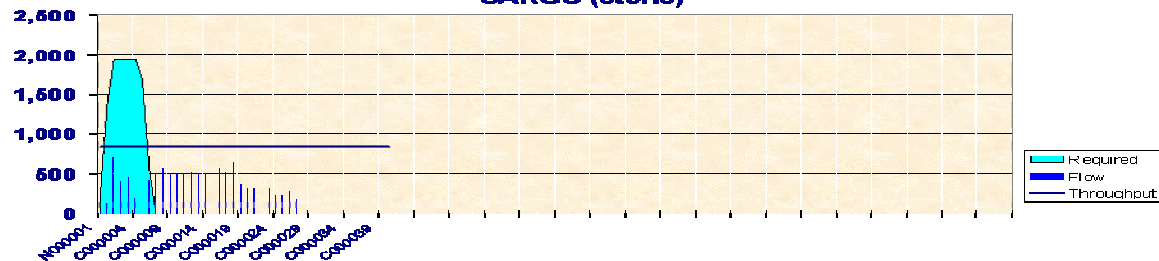
Airlift PAX by Day



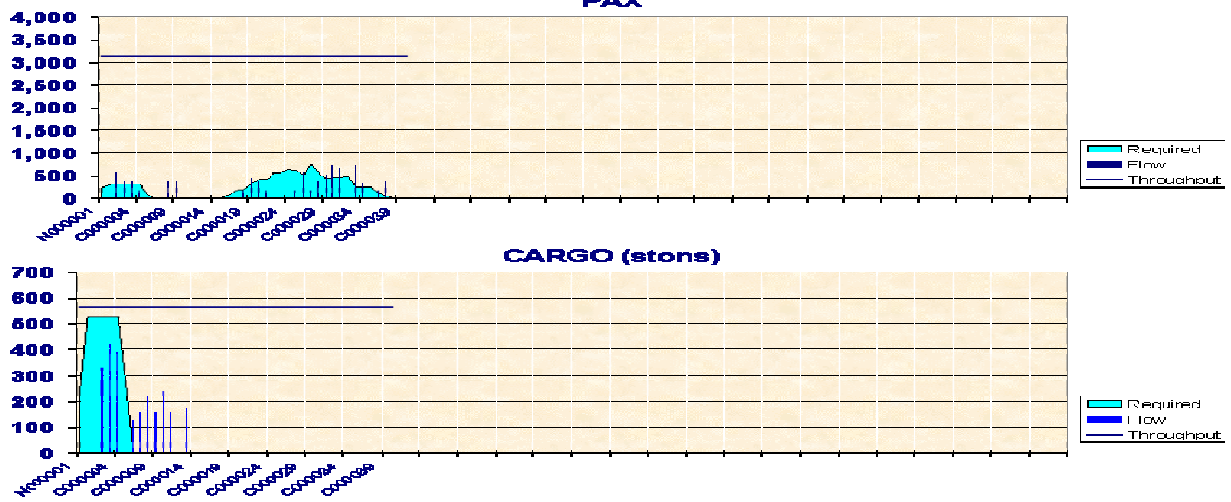
Kuwait Intl, Kuwait (MMDN/OKBK) PAX



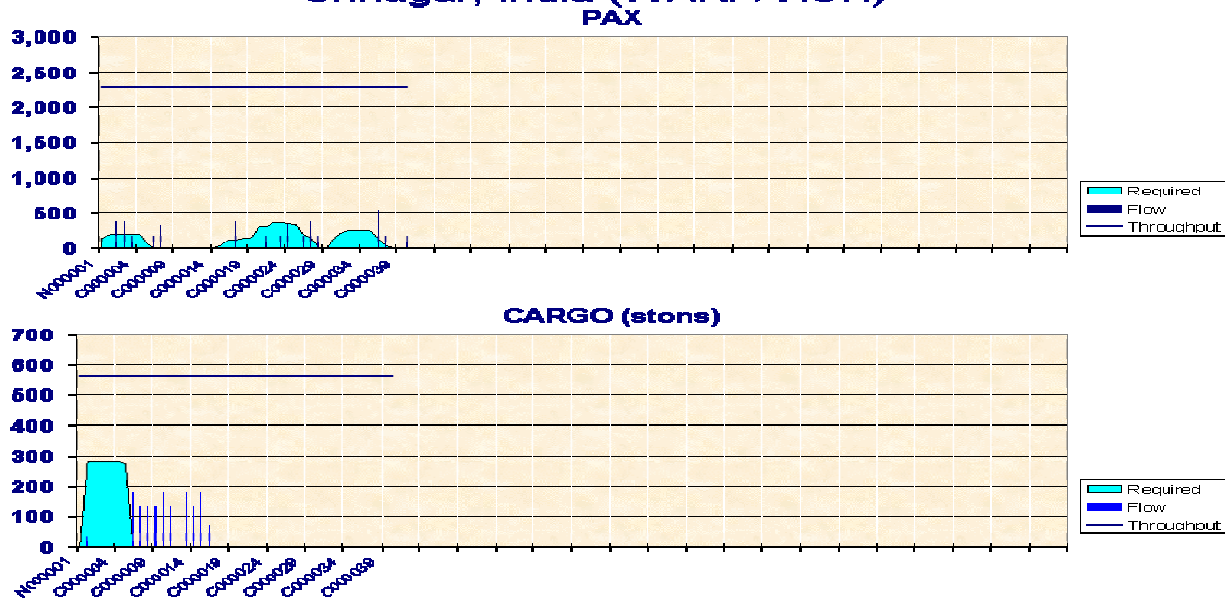
CARGO (stons)



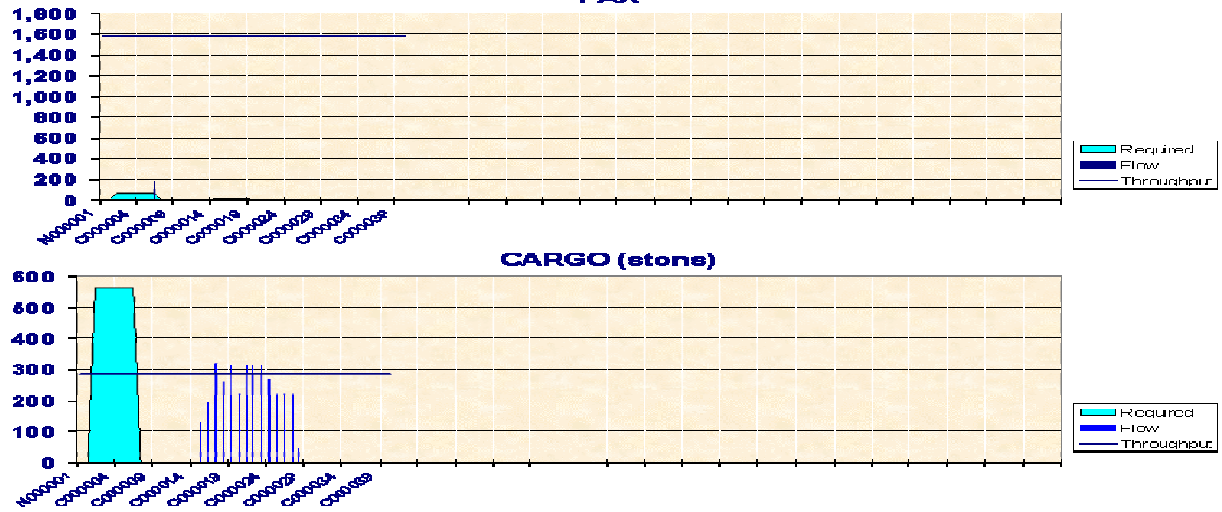
Chaklala, Pakistan (LQHQ/OPRN)



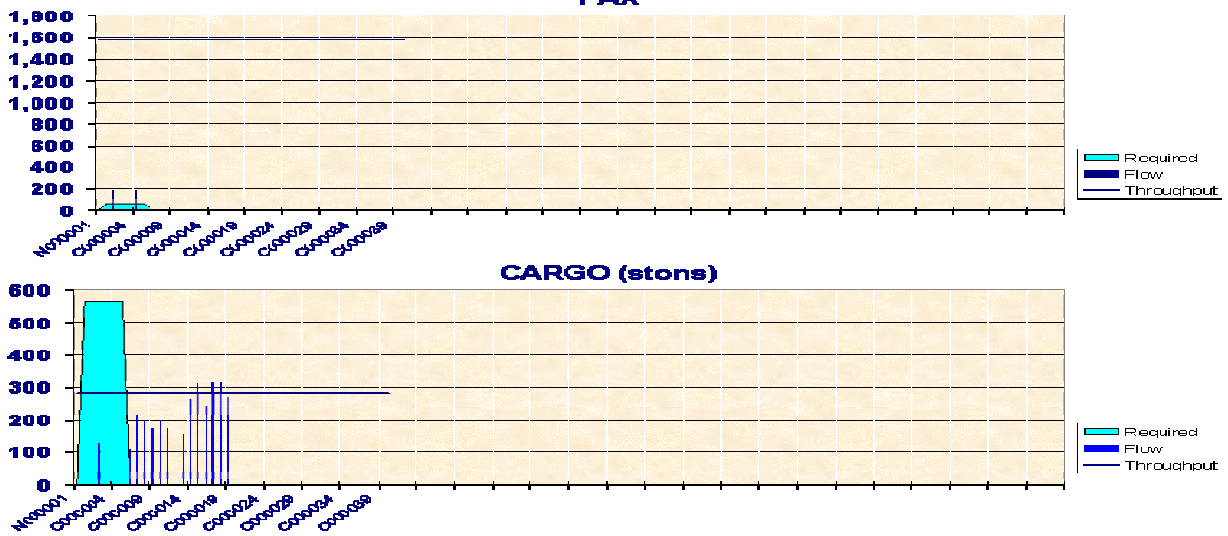
Srinagar, India (WAKP/VISR)

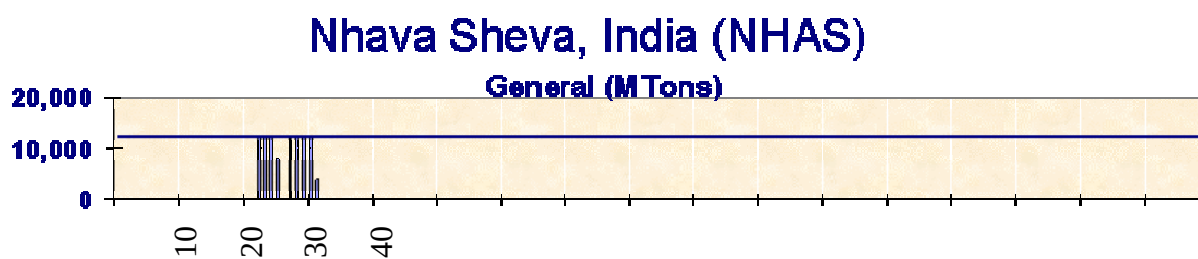
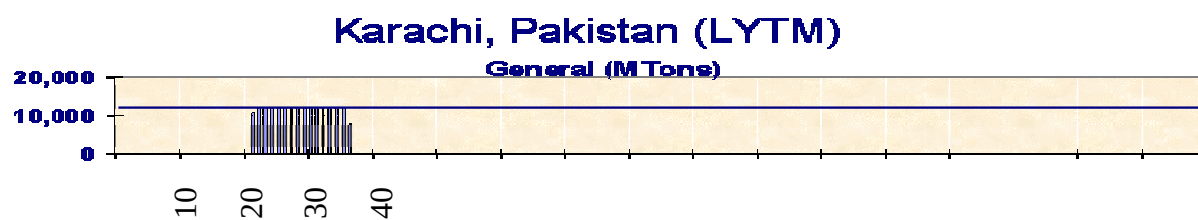


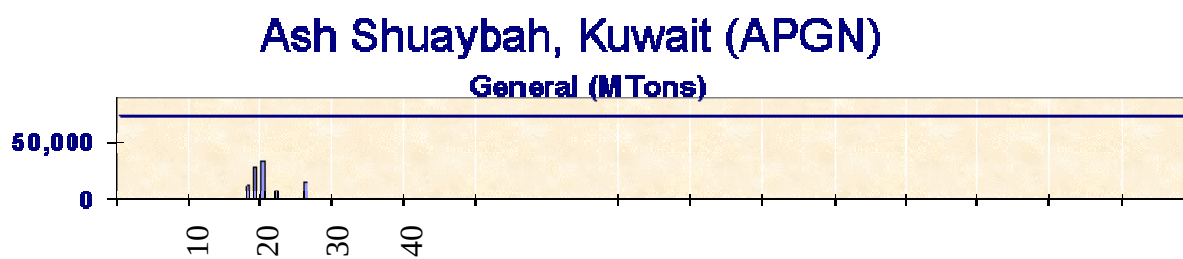
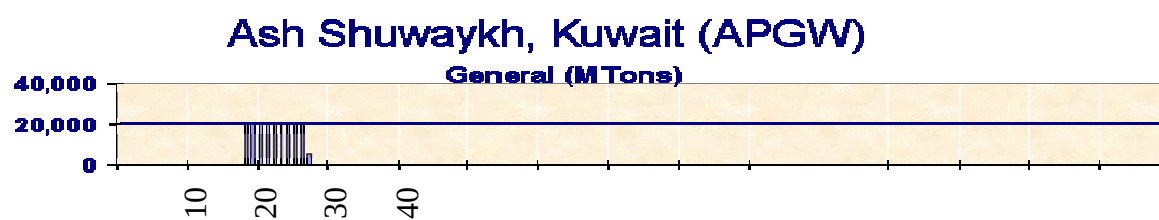
Masroor, Pakistan (PKUG/OPMR)



Bombay, India (BYGS/VABB)







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