Deployment Logistics and the Impact of Seabasing:

An Army Perspective

A Monograph
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Abstract

DEPLOYMENT LOGISTICS AND THE IMPACTS OF SEABASING: An Army Perspective, by MAJ Todd S. Zwolensky, US Army, 87 pages.

Deployment is one of the hardest and most critical logistical tasks. Since WWII, the development of distribution methods to overcome logistics issues has continued with mixed success. This monograph explores these issues and the methods used to mitigate them in a case study format. The three case studies used are WWII through the end of the Cold War, Operation Desert Storm and Operation Iraqi Freedom.

The findings of the case studies are that attempts to mitigate issues in logistics fail to address the entire distribution network. The methods discussed are the land-base concept (basing), Joint Logistics Over-The-Shore (JLOTS), regular transportation by either air or sea (bulk shipping), Prepositioning (PREPO), Joint Task Force Port Opening (JTF-PO), and the sea-base concept (Seabasing). Improvements made to one method hinder the success of other methods and fail to address the true problems of early entry command and control, visibility and capability issues that exist in the distribution process.

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Introduction

The US Army deploys its forces worldwide. These forces require supplies. The supplies come from many different places, move great distances, and end up in many different locations. The difficulty in transporting these supplies increases with the type of item supplied, distance traveled, and number and type of units supplied. This difficulty is not new and has affected how militaries conduct war since the formation of mass armies in the 1800's.[1] Carl von Clausewitz asked the question "whether war governs the supply system or is governed by it. We would answer that at first the supply system will govern war insofar as the other governing factors will permit; but where these start to offer too much resistance, the conduct of war will react on the supply system and so dominate it."[2] The issues from which the supply system suffers, greatly simplified, are getting enough supply, moving it to the conflict, keeping track of what is requested, what has arrived, what will be needed, and the effectiveness and efficiency of the process.

Throughout the history of the United States, the Army addressed these issues through individually focused initiatives. These initiatives range from the civilian contracting of supply during the Civil War, the militarization of supply in WWI and II, the increased contracting of supply starting in Vietnam, the increased use of containerization, and the advent of Prepositioned materiel during the Cold War. While most of these initiatives solved the single issue addressed, they created new issues to be resolved. Other initiatives based on commercial applications, like civilian provision of logistics during the Civil War and Spanish-American War, just-in-time logistics, and direct delivery post Operation Desert Storm did not work and faded away.

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

[2] Carl von Clausewitz, *On War*, edited and translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 337.

The Army, and increasingly the US Military through the joint community, benefited from the work to address these issues in 1987 with the consolidation of the transportation of logistics into a functional command USTRANSCOM.[3] The consolidation of the transportation of logistics, or more properly described the distribution of logistics, into a single point of responsibility refocused the efforts of resolving logistic issues in a holistic manner. Unfortunately, the distribution of logistics remains fragmented between several *methods* of transportation. Each of these methods has benefits and detriments in isolation, which is important because when used in combination, as they are in practice, these benefits compound and offset the detriments. These methods are the land-base concept (basing),[4] Joint Logistics Over-The-Shore (JLOTS), regular transportation by either air or sea (bulk shipping), Prepositioning (PREPO), Joint Task Force Port Opening (JTF-PO), and the sea-base concept (Seabasing).

Basing is the Outside of the Continental United States (OCONUS) land basing of materiel at improved and unimproved forward operating sites. JLOTS is the offloading of materiel at *unimproved seaports*. Bulk shipping is the military and commercial contract aircraft and ships that deliver the bulk of follow-on supplies during a conflict.[5] PREPO is the bulk storage of materiel in Army Prepositioned Stock (APS) and Marine Prepositioned Stock (MPS) close to projected combat zones for use in the bulk offload at *improved seaports*. JTF-PO is the command

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[3] USTRANSCOM is a functional command designated as the Distribution Process owner "The head of a DOD component assigned the responsibility by the Secretary of Defense to improve distribution processes that involve more than one DOD component. The process owner has the responsibility for coordinating, sustaining, and improving processes; coordinating the creation of new processes, where appropriate; and being accountable for their outcomes." (For further definition, see "United States Transportation Command: "A Short History" USTRANSCOM, http://www.transcom.mil/history/history.cfm (accessed 4 May 2010), or Department of Defense Instruction 5158.06.

[4] This term is different from seabasing because in recent memory all bases were on land. Last known use in U.S. Military vernacular prior to 2005 was WWII in the Pacific in the invasion of Okinawa. For further information see Thomas Hone, *Sea Basing: Poised for Takeoff* (Department of Defense: Office of Force Transformation, 15 February 2005)

[5] These are common term definitions within the logistics community. Further definition is available in FM 4-0 and JP 4-0.

and control unit designed to provide accountability and forward movement of material at *sea and aerial ports*. Seabasing is the ability, not the specific materiel or ships required, to move from a base at sea up to 200 miles inland utilizing storage and transportation at sea.

This paper addresses operational level logistic development, issues, methods, recommendations and areas of further study to streamline the distribution process in light of recent developments. Explanation of the development of logistics is important for contextual understanding of the linkage between the issue, previous attempts at solutions and suitability of recent developments in light of a holistic solution across all aspects of distribution. The issues are relatively simple to understand, but the solutions have proven difficult to implement because of the inherent conflict of logistics 'tail' constraining operations and the limits of logistical capability to enable operations. An example of this conflict is that a more efficient logistics system may be larger and more expensive in the near-term; however, it results in greater operational flexibility and reduced cost over time. Understanding the cost savings between the upfront cost of resolving the issue versus the workaround cost during and after the conflict is important to understanding the true cost of the logistic issue. The recent dual developments of seabasing as a joint initiative and the older designation of TRANSCOM as the distribution process manager for the Department of Defense (DOD) provide a rare opportunity to take a holistic view of the deployment transportation process.[6] The comparison of the current issues and methods allow evaluation of proposed solutions provided by these developments against the historical issues and vetting against the principles of logistics doctrine.[7]

The conclusion of this analysis is the recommendation of continued integration of the distribution process, specifically the integration and synchronization of the six methods of

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[6] U.S. Army, *Field Manual 4-0, Sustainment* (Washington, DC: Government Printing Office, April 2009), 2-4.

[7] Ibid., 1-2, 1-3. Integration, Anticipation, Responsiveness, Simplicity, Economy, Survivability, Continuity, Improvisation.

deployment in light of the command and control, visibility and capability issues that exist in the distribution process and the need to maintain this focus when confronting new concepts. Further examination determines that solutions must be holistic and focus on the entire process from materiel received at the depot through the retrograde. This paper describes the interworking of these methods of distribution and offers recommendations in the development of follow-on concepts. The consolidation includes the existing efforts to improve intransit visibility, intermodal processes, logistics command and control and offers further methods to improve command and control. The improvement of command and control remains a challenge. This paper articulates an analysis, solution and recommendation of the way forward by seabasing the command and control of logistics forces. In addition, an analysis of the Army's seabased logistics concept that compliments the seabasing of command and control is included. Efforts toward logistic consolidation must include all aspects of the process to achieve synergy and avoid negative effects in the future. In addition, analyzing the cost of current methods versus recommended solutions shows that the long-term costs of seabasing are lower than current methods with less flexibility. This analysis provides the Army a list of areas worthy of further study in its conceptualization of seabasing logistics capabilities.

Methodology

The focus of this monograph is to compare historical logistical issues the Army and US Military faced with those currently experienced and those expected in the future. This monograph is timely because significant changes occurring in the last two years, for example, in the Maritime Seabasing Initiative, significantly influenced logistical capability and thought. This monograph briefly addresses the history and development of six distribution methods currently used in deployment and their interactions: basing, bulk shipping, JLOTS, PREPO, JTF-PO, and seabasing. The impacts of these methods and the effects of containerization, contracting, and other outgrowths of these methods have far-reaching effects on operations.[8]

After explaining the current methods of deployment, this paper explores the logistical problems using a case study format. The first case study details the historical development of logistic issues and methods of mitigation from the beginning of WWII through 1989 and the fall of the Soviet Union. The second case study outlines the situation since 1989 and Operation Desert Shield and Desert Storm. The third case study details the current conflicts in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). The analysis details historical issues in deployment logistics and introduces the concept of seabasing and the potential and problems with this solution. The significance of this document is how the historical issues compare to a future concept. By exploring the issues without the lens of a specific program, then applying the program to those issues, a better understanding is gained of how the concept addresses those issues. This prevents the concept from driving the solution. Following the case studies, this paper outlines the linkage of the logistical issues and methods within the historical context for clarity.

[8] Historical basis for decisions, including the maritime evolution of seabasing and the development and use of contracting are critical to understand the implications for the Army but are not the basis of the monograph.

This examination of the historical issues and methods details how logistics tends to 'stovepipe' solutions. This observation, validated with the direction of TRANSCOM as the Distribution Process manager, leads to the examination of the seabasing concept in light of the historical analysis and the TRADOC White Paper *Seabasing*.[9] This monograph supports the seabasing recommendations, but also asserts that it does not go far enough in evaluation of the concept. Specifically, the Seabasing concept is currently valid for low and middle intensity conflict and has the potential to increase the speed of deployment for high intensity conflict in denied areas although without sufficient capacity. Cost savings and the resulting effectiveness, efficiency and flexibility show the upfront costs are more than offset by the benefits. The recommendation of this paper is that the Army logistics community must move ahead with a ship-based seabasing of logistics command and control. This paper details the means to further study this concept, implement a proof of principle and provides a timeline for implementation of this solution. These solutions describe the framework needed for study and follow-on implementation.

Sources cited in this paper include Army and Joint field manuals, articles and books on the subject and documents and presentations from the CASCOM, TRADOC and the USMC. In addition, the author's thesis on JLOTS and experience in C4 and C35 Combined Forces Land Coalition Command (CFLCC) from August 2005 - December 2006 provides additional background. Specific works proved invaluable: Martin Van Creveld's *Supplying War: Logistics from Wallenstein to Patton*, USTRANSCOM's *So Many, So Much, So Far, So Fast* on OPERATION DESERT STORM and Robert Work's *Seabasing All Ahead Slow*, on the Seabasing Concept. Although rediscovered later, the treasure trove of Scott W. Conrad's book *Moving the Force: Desert Storm and Beyond*, confirmed the thrust of the research and provided

[9] U.S. Army Capabilities Integration Center, "Training and Doctrine Command White Paper on Joint Seabasing: The Army Perspective" (Fort Monroe, VA: TRADOC, 7 July 2006).

motivation to complete this paper. The TRADOC white paper *Seabasing* and the documents from CASCOM and ARCIC detailed the background behind the Army's position and the development of the seabasing concept. The funding status and required capabilities are available through congressional testimony and public documents. Other primary resources include interviews and statements made by senior officials on program expectations and completions. Numerous secondary sources are available including Rand Corporation studies detailing seabasing capabilities and requirements.

This paper is different from existing work because it focuses on all methods of distribution and their development. The paper uses the logistic issues outlined in the TRADOC White Paper and shows the historical development and the unintended causality between some of the issues with the methods that addressed past issues. This holistic look at deployment logistics then focuses on seabasing and the individual elements it affects in the logistic deployment. By combining the historical development of logistics with a new concept, the author provides a neutral field to compare the concept not seen in other literature. The value of this analysis combined with the ongoing development of the 2015-2025 Joint Plan informs the US Military and specifically the Army as it moves toward addressing the issues of post OIF/OEF commitments.

Distribution Methods Defined

Deploying and supplying military forces at the operational level is complex and dependant on many factors. [10] The difficulty of deploying and supplying forces increases exponentially with distance, numbers, and types of transit points. One of the most difficult transit points is moving from the sea to the shore. Such sea to shore transit can be over a large improved container port or an unimproved beach crossing or directly to an airfield within the conflict zone. The methods used are the land-base concept (basing), regular transportation by either air or sea (bulk shipping), Joint Logistics Over-The-Shore (JLOTS), Prepositioning (PREPO), Joint Task Force Port Opening (JTF-PO), and the sea-base concept (seabasing).

Land basing of troops and supply is as old as the development of large armies. Once militaries grew large enough to require supply outside of what they could forage on their own, they required bases to receive, hold and distribute supplies. Clausewitz lamented, "One was tied to the depots and bound by the effective range of transport."[11] The advantage of land basing is the capacity and reliability, but it can quickly become a strategic vulnerability. The same disadvantage applies today. Units deploying from bases conduct their Reception, Staging, Onward movement and Integration (RSOI) at the base, move forward, and draw their supply from the base. The disadvantages of basing are the cost of building and maintaining facilities and the likelihood of retaining the base. If the base is subject to a lease or other negotiable construct, the base becomes a bargaining chip. If the improvements made are sufficient for use by the host nation, it becomes more likely to want it back. If the improvements are not made the base will require more time to develop before it is ready.

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[10] Operational level is defined as inter and intra theater logistics between the strategic and tactical levels.

[11] Clausewitz, 331.

Bulk shipping developed during WWII to move the vast quantities of materiel generated for the war. It did not immediately translate to commercial applications. This concept greatly increased in capacity since the advent of the container exchange (CONEX) in the 1960s. The US military developed the CONEX to provide an intermodal means to transport supplies with efficiency. With the increase in world trade in the 1980s, the use of CONEX increased and expanded throughout commercial shipping. This increase in traffic in the 2000s resulted in larger ships unable to be used in non-specialty ports and unable to transit choke points like the Panama and Suez Canals. This increase in capacity reduced the flexibility and applicability in military use for these same reasons.

Joint publication 4-01.6 defines Joint Logistics Over the Shore in the following passage:

> Logistics over-the-shore (LOTS) is the process of loading and unloading of ships without the benefit of deep draft-capable, fixed port facilities; or as a means of moving forces closer to tactical assembly areas. Joint logistics over-the-shore (JLOTS) operations occur when Navy and Army LOTS forces conduct LOTS operations together under a joint force commander (JFC). Traditionally, Navy LOTS includes the use of United States Marine Corps forces. Generally, LOTS operations will be joint in all but a few exceptions.[12]

JLOTS has been the traditional answer for movement over unimproved beaches since first used in 1915 during the Gallipoli Campaign.[13] Military operations used JLOTS in some form in Korea, Lebanon, Vietnam, the Falkland Islands and Operation Iraqi Freedom. However, it has not been the primary means of deployment for any Army since 1950. Since that time, JLOTS has been a secondary means of deployment, mainly retained by the Army and Navy as a last resort. The disadvantage of JLOTS is that it is highly complex, involves elements from different services, and as the figure below represents, involves many different activities working simultaneously.

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[12] U.S. Joint Chiefs of Staff, Joint Publication 4-01.6 *Joint Logistics Over-The-Shore* (Washington, DC: U.S. Joint Chiefs of Staff, 5 August 2005), xi.

[13] James A. Hutson, *The Sinews of War* (Washington, DC: U. S. Army Center of Military History, 1988), 59.

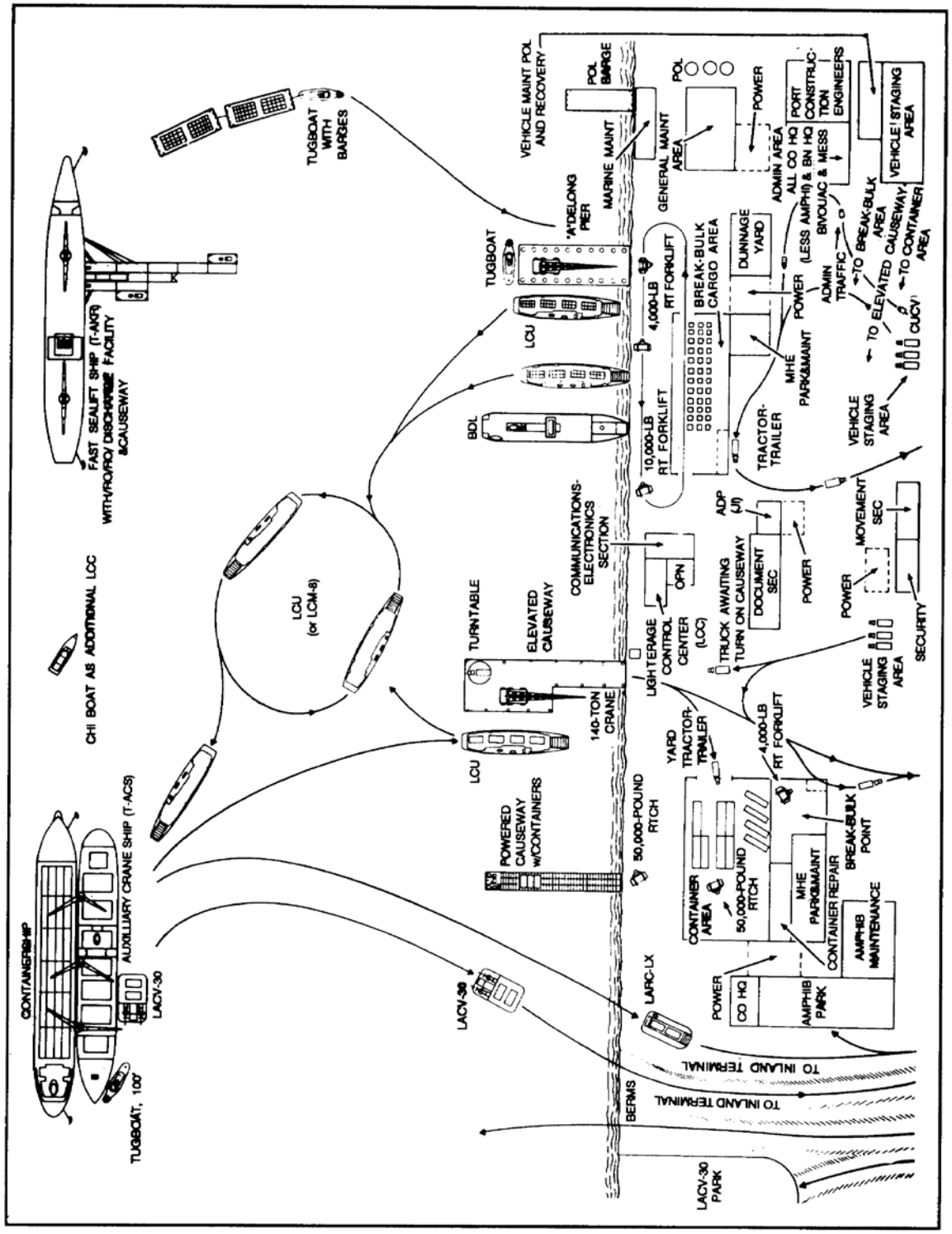

Figure 1 JLOTS Movement (entire) FM 55-60 p 4-1

JLOTS is one of the most difficult operations to conduct and requires low-density equipment specifically built for use in areas of insufficient infrastructure. Another key disadvantage is the time it takes to download a ship in comparison with a fixed port facility. JLOTS can only download an average rate of 100 vehicles in a 24-hour period. [14] This means that a Large Medium Speed Roll on Roll off ship (LMSR) carrying over 1020 pieces of equipment requires several days to offload in seas lower than sea state 3 compared to a single day at an improved port.[15] The advantage of this method is the ability to perform JLOTS on most beaches in the world under sea state 2. Recent technological improvements are increasing operations capability up to sea state 3. The US Military conducted low to mid level operations in these areas with increasing frequency since 1989.[16] The decrease in available improved port facilities worldwide increases the likelihood of using JLOTS in future conflicts. JLOTS provides flexibility to conduct operations in areas where other methods are unavailable.

Pre-positioned equipment is the afloat and land based equipment designed to speed the response to contingencies. The Army Pre-positioned Stocks (APS) and the Marine Pre-positioned Stocks (MPS) operate similarly. The APS consists of four different types: prepositioned unit sets, Operational Projects stocks, Army War Reserve Sustainment stocks, and War Reserve Stocks for Allies.[17] The prepositioned sets are unit equipment provided to units (land based) or moved to a contingency area (afloat) and provided to units whose personnel fly into the area. The advantage of this method is the speed of deployment. Equipment in CONUS moved to a contingency must be prepared for movement, rail loaded to the port, loaded on a ship and shipped to the contingency. This timeline includes the time required to marshal the railcars, marshalling the

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[14] U.S. Joint Chiefs of Staff, A-6.

[15] Military Sealift Command, *LMSR Facts* (Washington, DC: Military Sealift Command, 13 Jan 2010), 1.

[16] Appendix 7

equipment, loading the cars and tying down, marshalling locomotives, transit and switching time, unloading at the port, marshalling for ship load, and loading the ship before the ship leaves port. Once loaded the ship must negotiate the port, transit the ocean and any chokepoints such as the Panama or Suez Canal and move into the port for offload. The use of pre-positioned sets significantly shortens the timeline. This PREPO equipment based outside the theater is airlifted if the weight does not exceed the amount of lift available; however, in practice, only light units fly; heavy units usually transport by sea. Operational Project stocks of low-density items are generally located in CONUS with some tailored packages located in the other APS sets. These move the same as other prepositioned equipment and are simply unit equipment above the organization and equipment, table of distribution and allowances, and common table of allowance authorizations. These stocks include Aerial Delivery, Mortuary Affairs and Force Provider supplies. Army War Reserve Sustainment stocks are additional equipment and classes of supply designed to provide sustainment and replace losses to supplement units using pre-positioned equipment sets. These stocks bridge the gap between the start of a contingency and the establishment of sea based sustainment. War Reserve Stocks for Allies provide supplies for use by Allied nations and act as an additional reserve for US forces. The Army provides APS in five locations throughout the globe.

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[17] U.S. Army, Field Manual 4-0, *Sustainment* (Washington, DC: Government Printing Office, 4 February 2000), 4-9.

APS-1 (CONUS)	Operational Project (OPROJ) stocks and Army War Reserve Sustainment (AWRS) stocks.
APS-2 (Europe)	Contingency unit sets, OPROJ, and WRSA.
APS-3 (Afloat)	Unit sets, OPROJ, and AWRS.
APS-4 (Pacific and Northeast Asia)	Unit sets, OPROJ, AWRS, and WRSA.
APS-5 (Southwest Asia)	Unit sets, OPROJ, and AWRS.

Figure 2 Army Pre-positioned Stocks (APS) locations FM 4-0 p 4-10

The types of materiel stocked and the offload capacity of the port limit the speed of response. In contingencies without sufficient port facilities, PREPO uses JLOTS either as augmentation to existing facilities or alone.

Joint Task Force-Port Opening, a TRANSCOM initiative for intransit visibility and clearance at Aerial ports of Debarkation (APOD) beginning in 2005 and Seaports of Debarkation (SPOD) beginning in November 2009, addresses early entry issues for smaller conflicts.[18] JTF-PO with its sub-elements addresses these issues by providing intransit visibility on supplies that offload at the POD, assist with port assessment, and receive and transload supplies. It provides rapid early entry capability until augmented by the larger Theater Sustainment Command that replaces it. Prior to the development of this capability, the ability to track and move supplies did not exist in a separate port opening package. Units used ad hoc 'flyaway' teams to assist in the movement of materiel as the military moved into a location. The advantages of JTF-PO are

[18] USTRANSCOM, *2009 Annual Report* (Washington, DC: U.S. Transportation Command, 4 February 2000), 16.

numerous. The units (maximum 163 personnel) that comprise JTF-PO can handle up to 550 Twenty foot Equivalent Units (TEU) or 250,000 square feet minus broken storage every 72 hours.[19] This is more than most airfields can download due to size and available Maximum on Ground (MOG).[20] The disadvantage is that while JTF-PO handles airfields and small-sized contingencies very well, it quickly becomes overwhelmed in larger conflicts or multiple points of simultaneous entry. For example, one C-17 can airdrop 110,000 pounds.[21] One ship can equal more than 300 C-17 loads.[22] Most seaports can handle more than one ship. In these situations, the expectation is that larger formations arrive and set up the tracking and bring large quantities of material handling equipment (MHE) to clear the airfield, but "the Theater Sustainment Command takes about a month to get on the ground."[23] If the TSC is not available until later in the deployment, the effect on JTF-PO is the same as the effect of previous logistics systems, loss of accountability and materiel not clearing the POD.

Seabasing is a concept the Marine Corps began to promote as a means to overcome the dissolution of land bases. Operational Maneuver From The Sea, the first iteration of what would become seabasing, began as an attempt to advocate the opportunity in operations from the sea while avoiding the need and potential danger of bases on the land. This concept, formulated in 1991, consolidated and reintroduced in 1996 during the post Cold War drawdown and the

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[19] U.S. Marine Corps, *USTRANSCOM Initiatives*, (Quantico: Marine Corps Combat Development Command, 28 April 2008), 2.

[20] Eric Peltz, John M. Halliday and Amiee Bower, *Speed and Power: Toward an Expeditionary Army MR1755sum* (Santa Monica, CA: Rand Arroyo Center, 2003), xviii. "Deployments since 1990 suggest that an initial deploying force will often be faced with one APOD with a working MOG of three or less."

[21] John V. McCoy, "Configuring Airdrop Packages for the IBCT" *Army Logistician Magazine*, September - October, 2001.

[22] Military Sealift Command, "Intro Brief" (briefing, Scott Air Force Base, Washington, DC, July 2008), 1.

[23] Mike W. Petersen, "Rapid Port Opening Element: Logistics First Responders," *Army Press Release* (November 16, 2009), 1.

intervention in Bosnia.[24] Seabasing includes the physical presence of ships on the water and the Intermediate Staging Bases and prepositioning forces required to support the sea-base.[25] The increased attention of the defense community to areas around the world, specifically the littorals, in the Global War on Terror led to the development of the 2005 Joint Integrating Concept (JIC).[26] This formal acknowledgement by the joint community spurred development of the concept.

The Army response to the 2005 seabasing initiative came in the form of the 2006 TRADOC white paper "Seabasing". This paper suggested that the Army could support seabasing provided certain areas were addressed, "*employing the sea-base for C2 of forces ashore*; vertical maneuver from seabased platforms; exploitation of fires, ISR, AMD, and *sustainment capabilities within the sea-base;* and *use of the sea-base for RSOI of forces*."[27] These three logistical areas within the seabasing concept are within the scope of this paper. From 2006 to 2010, work to conceptualize the capabilities and requirements continued by the Marine Corps as well as within the joint community. Gains made in necessary equipment, sea state mitigation and fleshing out the requirements and capabilities continued in the commercial and scientific sectors. The sea-base concept, as currently articulated, promises to enable the Army to conduct RSOI and sustain its forces from the sea-base, this means deploying with less logistic footprint ashore. The current disadvantages of sea-base concept are that it remains a concept and requires greater joint interoperability and capacity to handle large-scale operations. These advantages and disadvantages discussed in detail in the future concept section of this paper compare the historical logistics issues to the seabasing concept.

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[24] Robert O. Work, *Thinking about Seabasing: All Ahead, Slow* (Washington DC: Center for Strategic and Budgetary Assessments, 2006), 97.

[25] Appendix 6.

[26] Ibid.,

[27] TRADOC White Paper, 14.

Case Studies

The three case studies show how logistics developed from WWII through the current operations in OIF. The case studies show the development of issues and the methods developed to mitigate those issues. Across all three case studies, certain trends uniquely American reoccur. When the US commits itself to conflict, it typically commits extensive resources to the conflict but no sooner has the commitment ended then a dramatic drawdown occurs. Once the US goes to war, it focuses its economic might on pushing as much materiel as possible to equip its military as best as it can.[28] This massive flow of material overwhelms the logistic system, as it simultaneously tries to build its capacity and manage the enormous flow of materiel. New methods of moving materiel developed to improve this situation created new issues to address. The case studies show that the logistics system has not had the means to maintain command and control nor the capacity to move, store and account for materiel early in the deployment process in each of the conflicts discussed. This gap in capability caused the loss of control and the subsequent problems for the duration of the conflict. The problems manifest themselves in the large quantities of materiel requested far in excess of consumed quantities, the amount of cargo frustrated in transload points, and the lack of visibility of cargo moving through the system. Ultimately, these problems result in a failure to provide effective and efficient support to the Soldier. Attempts to address these symptoms ultimately fail because they do not address the underlying problem of logistics command and control, and capacity early in the deployment process.

[28] Russell F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (1973; reprint, Bloomington: Indiana University Press, 1977), 207.

Case Study 1 - WWII to End of Cold War

The Army involvement in WWII marked the highpoint of modern logistics. The massive movement requirements dwarfed all previous efforts. The extensive use of mechanized forces required for the first time the widespread provision of fuel for ground forces. Foraging was the primary means of acquiring fuel in previous wars. Armies did not carry wood for fires, or forage for horses. Forage based logistics could not provide petroleum based fuel and cartridge based ammunition supplies. These items required infrastructure to produce and in modern warfare produced in significant quantities. Although railroads had been in use in conflicts extensively since the 1860s, the requirement to move the supplies from the railhead overwhelmed the ability to move them forward. Armies could no longer carry all that they used in battle without extensive ground transportation. According to Martin Van Creveld, "even as late as 1870, ammunition had formed less than one percent of all supplies (6,000 tons were expended as against 792,000 tons of food and fodder consumed). In the first months of World War I, the proportion of ammunition to other supplies reversed, and by the end of World War II, subsistence accounted for only eight to twelve percent of all supplies. These new demands could only be met by continuous replenishment from base."[29] This effort in WWII required an enormous transportation infrastructure, across the entire globe, each theater with unique geography and speed requirements unseen prior to that time. The increase in transportation requirements required refinement of existing transportation methods: basing, shipping, JLOTS and development of a new method of transportation to address these conditions; a floating base, the predecessor to seabasing.

Logisticians developed solutions in WWII to improve command and control and the distribution of supplies. The pressure of war, duration, and iteration of having to move between

[29] Martin Van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge: Cambridge University Press, 1977), 233.

theaters and reengage the enemy over the shore facilitated the development of the methods of moving used today. The issues of managing, storing, and moving supplies early in the war mirror the same issues faced today. The solutions of early entry, command and control, and transportation capacity throughout the distribution process developed during the war provide a contextual framework to address the issues.

Logistical issues severely constrained operations in the first major use of American ground troops in North Africa. Supplies originally shipped to the United Kingdom lost visibility in the supply system because "preference had been given to the deployment of combat and construction troops and antiaircraft units to England. Because of a lack of logisticians, it was impossible to unload supplies from the United States, to segregate and store them, and to outload them for Africa."[30] The lack of early deploying logisticians to provide command and control caused the command to request additional supplies, which compounded the congestion of the Atlantic convoy system. The Allies simply could not use the supplies already moved into theater early in the war because "much of the equipment that had been shipped for these units could not be located in the British Isles because it had not been properly identified and stored, thus requiring duplicate shipments from the United States."[31] The existing convoy and ground transportation shortage forced the theater commander to limit the US forces involved in the landing to 50% of the ground transport required. The allies made this decision to avoid limiting the size of the entire force, which they would have had to do to maintain the required ratio of ground transportation to combat troops. Once the landings occurred, the US units were unable to support the forward advance. The shortage of ground transport forced a logistical pause to let the

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[30] Roland G Ruppenthal, *United States Army in World War II European Theater of Operations Logistical Support of the Armies Volume I: May 1941--September 1944* (Washington, DC: Government Printing Office, 1953). As cited in Scott W. Conrad, *Moving the Force: Desert Storm and Beyond, McNair Paper No 32* (Washington, DC: National Defense University, 1994), 30.

[31] Conrad, 30.

supplies catch up to the advance. Scott Conrad articulated that the efforts early in the war before the invasion dramatically affected the effort later in the war. “The North African campaign clearly proved that combat forces depend directly on the capacity of their lines of communications. Early emphasis upon maximum quantities of combat troops and equipment at the expense of service troops and equipment had been faulty.”[32] As the war continued, the logistics preparations improved. However as late as October 1943, “logistics considerations were controlling the extent of operations and the timing”[33]

During the Normandy invasion, the Allies refined the large-scale use of bulk shipping and JLOTS to supply units on the shore. Extensive time was spent preparing logistical solutions to the landing. The development of the Mulberry harbor, Pipe-Lines Under The Ocean (PLUTO) and the use of block ships and landing craft are just some of the innovations that proved critical to the operation. The Mulberry harbor was a temporary harbor that floated into position and became an improved port. Pipe-Lines Under The Ocean provided the majority of fuel during the campaign.[34] Block ships and landing craft provided the means to move large amounts of materiel onto the beach. These solutions were redundant and overlapping in capability so when one of the Mulberry harbors and numerous craft sank during a storm the supply line to the shore had sufficient capacity remaining. Equally as important was the consolidation of logistics under a single authority for each side of the channel. This allowed the logisticians to plan for the invasion and react to changing conditions. This control facilitated the mitigation strategies used in the landing. The Allies experienced shortages of certain stocks of supplies in the opening days of the invasion; however, these shortages on the beach cleared by D+9 (15 June) and remained cleared

[32] Ibid., 31.

[33]George C. Dyer, *Naval Logistics* (Annapolis: United States Naval Institute, 1960), 171.

[34] Ruppenthal, 323.

throughout the duration of the campaign.[35] The logistics command and control considered the options and made the decision to bypass the plan and dump the supplies on the beach. This facilitated the landings with minimal disruption. Unfortunately, the same issue of ground transportation arose in the breakout from Normandy as it had in North Africa. As the supply lines increased, the distance trucks had to travel caused the shortage of fuel in the fastest moving units like General Patton's Third Army. Ironically, it was Patton during the planning for the invasion that killed the proposal to increase the number of trucks in each armored division.[36] This forced the command to use additional measures like the Red Ball Express to continue to support the offensive. Ultimately, even this could not mitigate the lack of land transport needed, requiring another operational pause. While this improvement in logistics over the beach was going on in Europe, the Allies in the Pacific faced different logistical challenges.

The Pacific theater was inherently maritime in its geography. The US Navy utilized the concept of using the ocean as maneuver space for ground invasion, articulated by the US in the 1930s, to overcome the geographic isolation of the Pacific and the deployment of the Japanese.[37] The strategy of island hopping, born of necessity, as the means to isolate the Japanese developed because "most of the Pacific islands, are too small to be converted into really formidable positions and are capable of housing garrisons of sufficient strength to put up a prolonged resistance, they could be knocked out before aid could be brought to them."[38] This allowed Admiral Nimitz to use the strength of his fleet to bypass and attack where he wanted. "Nimitz had to move his base along with him, which meant that his fleet had to be both his base of operations

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[35] Ibid., 393.

[36] Conrad, 48. Although the footnote Conrad provided is erroneous, the information is found in Kral's original CGSC manuscript. Anthony H. Kral, *Logistic Support Of An Armored Division In A Deep Attack* (Leavenworth, KS: U.S. Army Command and General Staff College, 1995), 18-19.

[37] Peter Paret, *et al.*, eds., *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (Princeton: Princeton University Press, 1986), 730.

and his striking force. It was, therefore, a four-fold organization-a floating base, a fleet, an airforce, and an army, combined in one."[39] This method, perfected during the battle of Okinawa, was expected to be used in the invasion of the Japanese mainland. The single command and control of logistics forces effectively moved supplies to the point of need while maintaining accountability preventing excess from offload. Unfortunately, the post WWII drawdown of the military eliminated much of the institutional knowledge of how to overcome logistical issues. Despite the production of after action reports and other documents, the ability to manage the distribution system would revert to the conditions that existed in North Africa in 1942. Although senior leaders would continue to write after WWII on the issues of centralized logistics control, early entry of logistics forces, visibility of stocks, and the need for transportation capability. Unfortunately, these writings did not result in action in the post WWII years.[40]

Following WWII, the Army made little preparation for another conflict in Asia. When the war in Korea began, the Army rushed supplies to the warzone and quickly overwhelmed the system. Supply units were not called up, rather combat units shipped out to the conflict. As noted by Conrad, "within three weeks after the conflict began, it became obvious that many of the lessons learned during World War II had been forgotten."[41] During the Inchon invasion, logistics command and control was an issue. The Army logisticians were not part of the planning and did not play a significant part of the early deployment because they were not on site during the

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[38] John Frederick Charles Fuller, *A Military History of the Western World, Vol. 3* (New York: Funk & Wagnalls, 1956), 597.

[39] Ibid.

[40] An excellent book describing the issues in logistics post WWII and recommendations to solve these issues in the future is Henry E. Eccles, *Logistics in the National Defense* (1959; repr., Westport, CT: Greenwood Press, 1981).

[41] Conrad, 27.

landing.[42] Command and control elsewhere was also problematic. Shipping from the United States was unorganized with equipment loaded in haste at the seaports and literally being dumped in the port of Pusan. Conrad details the effect this had two years later when "an Army general inspected the port of Pusan. He reported that, despite prolonged hard work, one-fourth of the supply tonnage stored there had still not been sorted out."[43] More than one-half of the material was coded high priority and moved to airfields when in fact airlift was not capable of moving the tremendous quantity of materiel.[44] Once the material arrived at the ports and airfields in Korea, ground transportation was not available in sufficient quantities to move supplies forward.[45] Again as in the early years of WWII, the speed of deployment and the overwhelming industrial might of the United States overwhelmed logistics command and control and transportation.

In peacekeeping operations with little threat of combat, the issues in logistics appear larger because enemy action cannot be blamed. In 1958, the Army and Marine Corps landed in Lebanon in a peacekeeping operation designated OPERATION BLUEBAT. Many of the logistics challenges manifested in previous operations bedeviled BLUEBAT, although for different reasons. For example, the logistics planners and units did not have access to the plan.

> The plan was not released due to the concerns or perceived concerns of NATO allies as to the dual tasking of forces in direct support of NATO with another mission outside of NATO. Detailed logistics planning was included in BLUEBAT, however it was never disseminated below the theater planning level. The logistical headquarters was not even stood up until a month prior to deployment. [In addition] the soldiers and units in support of the headquarters were assigned right before the deployment. Despite the lack of logistical coordination at the theater level due to the secrecy and lack of a logistical headquarters, the loading of supplies in CONUS proceeded ahead of schedule."[46]

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[42] Todd S. Zwolensky, "Logistics Over The Shore: A Review Of OPERATION CHROMITE OPERATION BLUEBAT And Its Relevance To Today" (Leavenworth, KS: U.S. Army Command and General Staff College, 2007), 11.

[43] Conrad, 28.

[44] Conrad, 27.

[45] Zwolensky, 18, 22, 23.

[46] Zwolensky, 32, 33.

The inability of the force to know its mission caused the deploying force to bring all their equipment while an overwhelming amount of CONUS based supply arrived as well.

The overwhelming amount of supplies and the lack of logistics forces to manage them caused significant issues in the deployment. “From the Inchon landing (1950) to the 1958 landing in Lebanon, supplies increased by a factor of ten. These numbers in part can be explained in the amount of supplies not used and subsequently backhauled out of the AOR.”[47] Although the force that went ashore was relatively small for this timeframe, under 10,000 Soldiers and Marines, the logistical issues significantly impacted the effectiveness. Pilferage was extensive as the operations and security forces were undersized for the area covered. Originally, it was planned that logistics personnel would provide security. Unfortunately, after individuals would work all day they were ineffective guards at night. In addition, “the numbers and ranks of the personnel were not adequate to handle all the airport and terminal operations. Due to the shortfall, the command had to divert combat troops into service as cargo handlers. Under combat conditions, it is doubtful whether the combat troops could have been diverted for this purpose.”[48] The offload point for the supplies required thirty-four acres. If the ships had completely offloaded, the area required would have been much larger, as would the troops required to guard it.[49] Since the ships were packed for maximum efficiency, selective offload was not possible. For instance, the Honest John missile system, an atomic capable system, was not needed for the operation. This system was loaded last and thus prevented many of the supplies needed first from download without a transload. Crews had to offload on the beach to make space to get other supplies more deeply packed, and then had to repack those supplies. In many cases, since the containers were not clearly labeled or not labeled at all, supplies were forwarded to the ashore site to be sorted. Due to

[47] Ibid., 43.

[48] Ibid., 36.

poor packing and hurried transload, large quantities were broken and unusable. The Marine Corps dumped 16 tons and the Army 10 tons of ammunition at sea due to damage in transport and inadequate storage. Inefficiency and pilferage became significant.[50] Despite little threat of combat, this small-scale contingency was illustrative of the continued issues that Army and Marine units face when they deploy. Training deficiencies noted before the operation and the After Action Review noted many of these same issues.[51] These issues continue to reappear from OPERATION BLUEBAT through Vietnam to the current operations in OIF/OEF because as soon as the operations ended, despite the baseline shortage of logistical capability, forces drew down. Although contracting of some functions to make up logistic shortfalls occurred in Lebanon, it became the preferred method to build capacity in Vietnam.

Business Week called Vietnam "a war by contract."[52] After WWII, the development of technological advancements in weapons and other equipment used to maintain these weapons necessitated an increase in the number of trained service technicians. During this time, the Army reduced the amount of military service troops and placed more in the reserve forces to reduce the 'tooth-to-tail ratio' of logistic troops to combat forces. To fill the void the Army contracted out many of these functions. Contracting out these functions provided short-term cost savings as the personnel released at the conclusion of the contract did not require retirement and severance benefits. Realization of the anticipated long-term cost savings from the utilization of contractors proved problematic as the oversight capabilities of the military lag the profit motive of the contracted companies leading to inefficiency in the delivery of services. Contracting mitigates the

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[49] Gary H. Wade, *Rapid Deployment Logistics: Lebanon, 1958*, Combat Studies Institute Research Survey No 3 (Fort Leavenworth, KS: Combat Studies Institute, 1984), 75.

[50] Zwolensky, 40.

[51] Wade., 75.

[52] Charles M. O'Connor, "Vietnam: How Business Fights the 'War by Contract,'" *Business Week*, 5 March 1965, 58-62, cited in Stephen J. Zamparelli, "Contractors on the Battlefield: What Have We Signed Up For?" *Air Force Journal of Logistics*, 23 (Fall 1999), 10.

lack of logistical capability, but requires increased oversight. In addition, contracting creates another seam in the logistical process. With a return to contracting large parts of the logistical system, the Vietnam War became much like the American Civil War in that large amounts of supplies managed outside the military logistics system are then handed off to the military for end use. The connection between the contracted functions and the military requires command and control for accountability to prevent waste. Despite an increase in the quantity of supplies moved through the contracting process in Vietnam, waste was appalling.[53] The military was unable to maintain the accountability of the supplies, and by 1968 almost 2 million tons of supply was on the ground of which only a third could be identified.[54] Despite the cost and other issues, the lack of logistical capability and long-term focus ensured contractors would become more prevalent in conflict since Vietnam. As contracting increased the volume of materiel moved to a conflict, other improvements in logistics developed in response to the threat of the Soviet Union in Europe.

The Army during the 1970s and 1980s developed logistics programs to ensure troop and equipment availability in response to a Soviet invasion of Western Europe. Due to the timeline of the expected conflict, the critical requirement became the speed of deployment. The Army built large PREPO facilities in Europe to store supplies and equipment for deployment exercises. These REFORGER exercises combined with other exercises such as Nifty Nugget in 1978 led to the natural conclusion that larger ships and upgraded port facilities allowed the Army to redeploy to Europe in less time.[55] These developments along with the move to containerization starting in the 1950s developed an Army that could deploy in mass provided the availability of adequate

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[53] Conrad, 37.

[54] Ibid.

[55] James K. Matthews, *So Many, So Much, So Far, So Fast: United States Transportation Command and Strategic Deployment for Operation Desert Shield/Desert Storm* (Washington, DC: Government Printing Office, 1996), 148.

facilities. With the prevalence of Soviet and US funded air and seaports in Third World countries, this paradigm of bulk offload and movement was sustainable in most parts of the world.

The ability to move supplies and equipment to most of the world and control that movement was the logistical requirement of WWII. Repeated landings resulted in the development of equipment and techniques designed to improve the movement and accountability of supplies. Lessons learned during that conflict included the importance of robust logistics command and control and capability early in a conflict. Logistical planning improved and culminated in the Normandy invasion. The Army relearned these lessons in operations throughout the Cold War. Hindered by a lack of command and control and robust logistics infrastructure, the Army logistics struggled in Korea and Lebanon. Faced with a long war in Vietnam and continued technological developments, the US Military used contractors to provide the missing logistical capacity. The use of contractors increased the amount of material moved, but increased the cost and created a new seam in the process to manage and a new issue of contract oversight. The large quantity of materiel and urgency with which it shipped continued to overwhelm the capacity of the logistics system to maintain accountability. This lack of visibility resulted in even more cargo ordered and increased the requirements to account for and store the supplies. Efforts to improve the process during REFORGER resulted in an increased speed of deployment requiring specific conditions including improved bases, ports, and stockpiled equipment. It was unknown at the time if these improvements would apply to a conflict outside of Europe.

Case Study 2 - DESERT SHIELD to IRAQI FREEDOM

Since the fall of the Soviet Union, the improvements in basing, bulk shipping and PREPO combined with the increase in weight and volume of required sustainment created additional pressure on the traditional logistics issues. The current environment evolved from issues that occurred in 1990 - 1991 during Desert Shield / Desert Storm. This operation highlighted the Cold War focus on utilizing improved ports and focused the US Military on further increasing air and sea transportation capacity. In hindsight, this focus on moving personnel and materiel created other issues in distribution process. Despite efforts to improve lift capability before and after Desert Storm, specifically sealift improvements and the development of increased capacity ground transport, lift was insufficient in the next large conflict, OEF/OIF. Improvements to intransit visibility and supply discipline also failed to increase commensurate with the increase in supplies shipped and failed to mitigate the issues seen in Desert Storm. The factors of increased weight and volume requirements as well as the dependence on fuel as the primary commodity remained through OEF/OIF. These issues, although different in specific means, manifest themselves in the same historical issues logistics encountered in previous deployments.

The increase in weight and cube of equipment and materiel exacerbated these issues. Scott Conrad wrote in 1994 in his book *Moving the Force: Desert Storm and Beyond*, that "strategic mobility has eroded as the force has steadily put on weight. According to the *Armed Forces Journal*, the weight of a mechanized division has grown 40 percent since 1980."[56] The majority of this weight and cube increase is due to the M1 Abrams Tank and the M2 Bradley Infantry Fighting Vehicle (IFV). However, other items increased in weight as well, the HMMWV

[56] Conrad, 15.

replacing the M151 Jeep being yet one example.[57] This increase in the size of the equipment required an increase in the quantity of materiel transported.

Ammunition requirements increased as the weight of ammunition increased with the increase in calibers used. The 120mm cannon of the M1 replaced the 105mm cannon of the M60. The 25mm cannon of the M2 replaced the 50-caliber armament on the M113. The 155mm Self Propelled howitzer, although introduced in Vietnam, had its stowage capacity increased from 36 to 39 rounds in the Desert Storm variant. The HMMWV has crew served weapons such as a 50-caliber, TOW or MK-19 mounted on many of its variants versus few M151 crew served weapons.[58] In addition, "One reality of modern warfare emerged: Forces poised for rapid deployment grow markedly when faced with a protracted conflict. Upon alert, steps were taken throughout the 82nd Airborne Division to increase on-hand equipment and supplies not normally authorized--especially additional antitank systems. This added significantly to the transportation requirement"[59]

The increased mechanization of US Forces required more fuel than previously used. The main increase was due to the M1 tank. The M1, unlike its predecessor the M60, uses a turbine engine and gets 1.7 miles to the gallon, consuming 12 gallons an hour at idle.[60] 1,848 M1s along with the heavier M2 and HMMWV deployed to Desert Storm increased fuel requirements. As Conrad notes, "during Operation Desert Shield, the defensive phase of the Gulf War, each Division required 345,000 gallons of diesel fuel, 50,000 gallons of aviation fuel, 213,000 gallons

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[57] Individual systems have an aggregate impact on logistics. Both the HMMWV and 5ton trucks in the Army and the HMMWV and 7ton trucks in the USMC are the most common end items in the inventory. The PLS and HEMTT trucks while adding to the lift capacity of the force also add to the deployment requirements.

[58] Although a kit was available to modify the M151 only recon and scout units regularly used it in U.S. service. The M38 did not have the kit and modified locally according to units' desires.

[59] Conrad, 29.

[60] Steven Komarow, "Military's Fuel Costs Spur Look at Gas-Guzzlers," *USA TODAY*, March 8, 2006. http://www.usatoday.com/news/world/iraq/2006-03-08-military-fuel_x.htm (April 25, 2010).

of water and 208 40-foot trailers of other supplies ranging from barrier material to ammunition each day. During the 100 hour offensive of Operation Desert Storm, a single division consumed 2.4 million gallons of fuel transported on 475 5,000-gallon tankers."[61] This does not count the requirements of the other US Military Services or allies.

Although the increase in equipment size drove the fuel increase, the environment drove the water increase and was comparable to usage in previous desert environments. Not planned for was the use of bottled water instead of bulk water. Bulk water was the means of distribution of water in previous conflicts. Units would procure water from local sources. Where water was unavailable, it was transported in large trailers then smaller unit trailers, 'water buffalos' for soldiers to fill up their canteens. The smallest bulk transport of water was the use of 55-gal drums during the Inchon invasion. In Saudi Arabia, much of the water produced for the public is in bottles. The Saudis provided bottled water as host nation support for the United States. Bulk water is easy to transport efficiently, the trucks used are only for that purpose and the amount of water hauled is greater because there is no packaging. Bottled water requires flat bed trucks and MHE to move at each transload point. Preparation of the water is the same but the added infrastructure and materiel required for bottling necessitates another level of demand planning. The full impact, mitigated because the Saudis provided the trucks to move the bottled water, was not felt until the military moved forward in Desert Storm without this augmentation. As Conrad noted, "although the Army deployed nearly 75 percent of its truck companies in support of only 25 percent of its combat divisions, there was still insufficient ground transportation to move the force. Many believe that had the war gone longer than 100 hours, combat operations would have come to a quick halt until the logistical tail caught up"[62] The timeline of the war prevented confirmation of this fact, that the transportation system cannot handle moving over 1100 pallets

[61] Conrad, 15.

[62] Conrad, 47.

of water per division per day in addition to its designed load.[63] The logistical problem this caused lasted through to OEF/OIF.

Fortunately, the deployment in Desert Shield was similar to the REFORGER exercises conducted during the latter half of the Cold War. In both cases, the facilities used to deploy were world class, the timeline was acceptable for reserve mobilization and the greatest logistical requirements were mitigated by the host nation. Although Desert Storm involved elements of 12 divisions, they deployed over six, almost seven months, versus three brigades in two weeks with prior notification of the reserve elements. [64] Saudi Arabia's port facilities are world class because the country imports almost everything it consumes. Ad-Dammam was capable of handling 39 ships simultaneously and Al-Jubayl, the most modern in the world at the time was capable of handling the largest ships. Airports at Dhahran, Riyadh, and King Fahd were equally impressive. Airfields and military camps like King Khalid Military City built specifically for forces to move into were critical to the infrastructure capacity. Host nation sources supplied fuel and water, the greatest quantity of supply by weight, and the transportation for this materiel. Countries from Germany to Saudi Arabia provided shipping and ground transportation like the Heavy Equipment Transport critical to mitigating US shortages.[65] Operation Desert Shield / Desert Storm demonstrated the US capability to deploy large-scale forces using extensive host nation support on a similar timeline as the REFORGER exercises.

With this operation contextually framed, it is important to look at the issues that developed. Like previous conflicts, Desert Storm had similar issues with logistics command and

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[63] 213,000 usage for a division divided by 6 gal bottles to a case, 32 cases to a pallet (8 cases per layer x 4 cases high)

[64] REFORGER exercises were conducted to move the three brigade size units into theater. Training conducted after movement was supplied locally from Germany. The exercises were limited in duration. These exercises lasted from 1969-1993. The first division to deploy completely was 1st Cavalry Division in 1983. The three division equivalents, one corps and the sustainment command stationed in Germany at the time dwarfed the size of the division involved in the exercise.

[65] Conrad, 39.

control, early and sufficient arrival of logisticians culminating in the loss of supply accountability. This resulted in more supplies shipped, which choked the transportation system and resulted in the delay of equipment and the degraded ability to receive, store and move supplies from the ports. The Military required host nation support and contracting in mitigating this capability shortfall. Mitigation was only partially successful and required more time and high level injects to execute successfully. Despite these actions, equipment delays caused unit delays and this delayed the start of the operation.

The ability to deploy units successfully remained a concern despite the facilities available because of transportation limitations. These limitations were similar to previous conflicts with the exception that personnel arrived faster in this conflict due to airlift capacity. The 82nd Airborne Ready Brigade arrived within 2 days of the beginning of operation. The Marine Corps MPS ships, based in the Indian Ocean, containing 7th MEU arrived four days later. By comparison, this was 2 days after the first CONUS based ship departed the US. The 7th MEU was combat ready 18 days after the start of the operation. The entire 82nd Division closed on 19 days after the operation began. The first Army Heavy Division, 24th Infantry Mechanized, closed over a month and a half after Desert Shield began with the 197th Separate Brigade Mechanized arriving a day later.[66] The gap remained between early entry light forces and heavy forces shipped from CONUS. Significantly closing the gap was the MPS ships. In this first test of the PREPO sea-based concept, it was a success. PREPO allowed ships to offload before the arrival of CONUS based ships.[67]

Logistics units arrived after the combat units with the 1st COSCOM supporting the 82nd Division arriving on 1 October, 64 days after the start of the operation. On 10 November, the US

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[66] Conrad, 24.

[67] Later in OEF/OIF, the consequences of the Army and the Navy having PREPO would cause further mobility and capacity issues.

and Saudi Arabia signed the Logistics support agreement providing fuel for the operation. This was 74 days after the start of the operation.[68] The theater commander pushed combat units ahead of logistics units due to the threat of further advance by the Iraqi Army, while the logistics units were second on the Time Phase Force and Deployment Data (TPFDD).[69] This decision undoubtedly influenced by the ability of logistics units to deploy in a timely fashion, and as seen in other conflicts, the initial need for logistics units is seldom a priority. The expectation remained for combat units to use their organic capability to support themselves until lift existed to allow the logistics overhead to deploy. The main logistics issue with expecting units to support themselves was the fact that troops no longer deploy with their equipment and require logistics unit capability to reconstitute their strength. This practice began during the Vietnam War, but it was used extensively during Desert Storm. This decision resulted in severe consequences to mobility and capacity in follow on deployment.

Supply command and control was insufficient in the early phases of the deployment. Logistic command and control units tried to deploy at the same time as combat units and could not operate as they themselves moved into position. As in earlier conflicts, the theater commander created an ad hoc logistics organization to support the deployment as the problems developed. The 22nd Support Command attempted to mitigate the worst of the issues; however the lack of early entry command and control and insufficient intransit visibility caused a loss of accountability and a corresponding increase in supplies requested. The 22nd commander stated, "28,000 of the 41,000 arriving containers had to be opened pierside to find out their contents. Then many were hauled 2,000 miles out in the desert just to find that most of their contents really

[68] Matthews, xix.

[69] Brian Newberry, *To TPFDD or not to TPFDD Is the TPFDD Outdated for Expeditionary US Military Operations?* (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 2005), 8.

belonged to units near the ports."[70] Tremendous excess supply moved to theater and retrograded after the conflict ended. For example, "there were 78 ammo laden ships still awaiting offload the day the Gulf War ended, and of 3.2 million rounds of 155mm howitzer shell moved to Saudi Arabia, 2.9 million had to be returned."[71] This 'iron mountain' of supply confounded accountability efforts and overwhelmed the transportation system.

Sealift was able to move the majority of equipment and supplies on time and in greater quantities than ever before. The issue with logistics in Desert Shield was the same as issues faced by logisticians in the UK early in WWII how to receive the stocks, store, and move them forward while maintaining accountability. As in previous conflicts, this was difficult when equipment arrived at the ports in theater with incomplete manifests. The rush to ship cargo from the US resulted in containers arriving with nothing more than Saudi Arabia listed as a destination.[72] Fortunately, the ability of the host nation to support the deployment through both the excellent facilities and the provision of water and fuel was instrumental in increasing capacity. The lack of visibility caused additional supplies to be pushed into theater, further clogging the system at the port, and slowing down the movement of those supplies. "Eventually, over 220,000 tank cannon rounds were moved to theater, only 3,600 rounds of which were actually fired. Just as in the past, instead of asking, 'How much do we need?' the emphasis was on 'How much can we get?'"[73]

Airlift was instrumental to moving personnel as it had been in Vietnam. Like Inchon, Lebanon and Vietnam, the amount of materiel expected to be shipped by air overwhelmed the airlift available. As Conrad explains this is "because units at war are authorized to order supplies at the highest priority, the airlift system-flying only high priority cargo-was saturated and could

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[70] Conrad, 36.

[71] Conrad, 68.

[72] Matthews, 182.

[73] Conrad, 16.

not keep pace with demands. By December 1990, there were more than 7,000 tons of cargo on the ground at just one of the air hubs-Dover Air Force Base- exceeding total airlift capacity by six fold."[74] In spite of these issues, airlift moved more cargo than ever before, although to achieve this required the involvement of the Secretary of Defense to personally direct and allocate priorities.[75]

Accessibility was not a significant issue during Desert Storm although it easily could have been. "If the United States had not gained ready passage to the ports of Saudi Arabia, its determination to deploy forces may have been far more tenuous."[76] The major ports and airfields used in the conflict were within reach of the Iraqi forces if they had decided to press the attack. The only viable alternative was the port of Jeddah on the Red Sea. TRANSCOM conducted one test with 92 containers to determine if this was viable, but the cost and delay in moving the containers caused TRANSCOM to rely solely on the Persian Gulf ports.[77]

The logistical issues in Desert Shield and Desert Storm were similar to early entry operations at the beginning of WWII, Korea and Lebanon. Although the ships were less numerous, their capacity was much larger although not enough to meet the increased demand. Planners gave combat units priority due to transportation limits. Airlift was overwhelmed with priority cargo, much of which could have moved by sealift and faster. The logistics command and control was an ad hoc organization and was not in place until later in deployment due to the lift priority. This combined with the wave of supplies arriving from CONUS eliminated any chance at supply visibility. The lack of accountability and the enormous quantity of supplies contributed to large unsorted stockpiles at the ports that the ground transportation was unable to move

[74] Ibid., 26.

[75] Ibid., 27.

[76] Ibid., 17.

[77] Matthews, 183, 184.

forward in sufficient quantities. Only by using host nation support were requirements met. Like Vietnam, contractors were required to mitigate the lack of logistic forces, although the host nation provided many of these contracts. At the conclusion of hostilities, the ‘iron mountain’ shipped back to the US at great cost. Logisticians focused on this cost and how to reduce it as the most important lesson learned from Desert Storm.

Case Study 3 OPERATION IRAQI FREEDOM

Following the success of Desert Storm, the logistics community decided to build upon the success of seabased PREPO, ready bases, standardized sealift and airlift. The failure of supply accountability and the resulting 'iron mountain' was addressed as well. In addressing this issue, the Army and Air Force logistics leadership moved towards a wholesale logistics transformation, incorporating civilian logistics concepts like Just-in-Time-Logistics to move from a supply based system to a distribution based system. This move was made in the mistaken belief that the issues in Desert Shield / Desert Storm were a product of an excess of supplies not the lack of handling capacity and command and control.

The success of the Maritime Prepositioned Ships for the Marine Corps in Desert Shield prompted the Air force and Army to address its mobility and capacity concerns by expanding the eight PREPO cargo ships to sixteen afloat with two land-based Brigades.[78] The Department of Defense and the Army purchased faster, larger means of mobility to get the materiel to theater. The LMSR and the new C-17 expanded the ability to react quickly from CONUS bases. These vessels enable the Army to move more to Points of Debarkation, faster. Whether those Points of Debarkation are capable of supporting the throughput was put to the test in OEF. OIF displayed the issue of accessibility when at the start of the war, 4th Infantry Division could not transit Turkey.

The transformation of logistics began in 1992 with the Total Distribution Plan (TDP). Robert McKay in his article on transformation stated, "this program was the Army G4's plan to respond to the Vice Chief of Staff of the Army's request for a program that would correct the

[78] Federation of American Scientists. "Sealift" (October 19, 2000). http://www.fas.org/man/dod-101/sys/ship/sealift.htm (accessed 27 April 2010).

logistic deficiencies identified following Operation Desert Shield / Desert Storm."[79] The TDP articulated the idea that supplies should not be placed in various caches at the different levels of the organization as traditionally done, but should be pushed out as needed to the units requesting it through a hub and spoke system. The advantage of this system was the reduction of supplies stored at each level, and taken together fewer stocks are required. Less important to the concept, though in the forefront of the minds of planners faced with post Cold War reductions, was the possibility of the consolidation of transportation at higher echelons and a net reduction of supply personnel needed to implement this program. The disadvantages were the visibility required to use this system and the assumption that this could be used in any conflict regardless of intensity, distance, and duration. This plan, modified in 1997, would be the driving concept to move Army logistics into a distribution based system.[80]

The focus on efficiency in logistics after Desert Storm was encouraged by the drawdown of forces and the appeal of civilian management structures. The idea of Velocity Management (VM) borrowed from Walmart was the basis for transformation to Just-in-Time Logistics from the Just-In-Case[81] logistics of Desert Storm. Illustrative of the transformation, at the start of Desert Storm units "crossed the line of departure (LD) with an average of 60 days of supplies on hand. For OIF, 5 days of supply was the average on hand."[82] Enabling this transformation was Total Asset Visibility (TAV) and responsive transportation. TAV was the idea that all requests, stocks, and inbound supplies would be available to each level of the organization just like the way

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[79] Robert McKay, "Transformation in Army Logistics." *Military Review* (September-October 2000), 49.

[80] Eric P. Shirley. "Army Battlefield Distribution Through the Lens of OIF: Logical Failures and the Way Ahead" (Leavenworth, KS: SAMS Monograph, U.S. Army Command and General Staff College, 1995), 12.

[81] This term, in general use after Desert Storm, was used diversely to refer to supply based logistics. It is included to show that the use of the term showed a lack of understanding of the causes of oversupply in Desert Storm.

Walmart and other civilian companies use this concept. Due to the low stockage level of supplies transportation would have to be responsive to maintain such slim stockage levels. The transformation from supply-based logistics to distribution based appeared to work well in Bosnia, Kosovo and in garrisons throughout CONUS and Europe. This success quieted many critics.[83] Although hints of the cost savings overriding the ability of the system to see and move supplies were highlighted in a 2001 effectiveness study, the program would be tested in OIF, with a large deployment of equipment and materiel.[84]

Without logistics command and control, or the intransit visibility critical to the concept in place, the system failed. The results were that the Army did not have the visibility to see the requests, stocks, and inbound supplies even above the brigade level where the system of systems specially designed for this purpose should provide visibility.[85] Combined with the increase in materiel, much of it again shipped without documentation, the TAV concept was unable to work. The lack of responsive transportation, ground transportation companies in the reserves, ships contracted and called up out of the reserve ready fleet, and aircraft delayed the movement of materiel once it was located. Overseeing this system was the 377th Theater Support Command, a reserve unit that "was not fully operational with its required units until after the conclusion of major combat operations.[86] The result was that "logistics in OIF were less than an unqualified success."[87]

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[82] United States General Accounting Office, "Transportation and Distribution of Equipment and Supplies in Southwest Asia"(Washington, DC, 1991) 12.

[83] Mark Y.D. Yang, *Accelerated Logistics: Streamlining the Army's Supply Chain,* MR-1140-A, (Santa Monica: RAND, 2000), 29.

[84] Rick Eden, *How is the DoD Logistics Transformation Coming?* DRU-2505-RC (Santa Monica: RAND, 2001), 11-13.

[85] Shirley, 12.

[86] Gregory Fontenot, E.J. Deegen, and David Tohn, *On Point, The United States Army in Operation Iraqi Freedom* (Fort Leavenworth, KS: Combat Studies Institute Press, 2004). 408.

[87] Ibid.

In an attempt to mitigate the lack of command and control intransit visibility, stopgap measures such as limited wartime accountability and the extensive use of contractors, commercial containers, and personal approval of the highest levels of leadership on transport allocations followed the transportation meltdown at the beginning of OIF.[88] The largest of these mitigation methods was formal suspension of accountability. Due to the time required to reestablish accountability, OIF/OEF required the suspension of standard accountability procedures in May 2003. The suspension of accountability was implemented to relieve commanders of restrictive accountability during the initial Relief in Place. Equipment and supplies were in numerous locations and could not be effectively located or moved for handover. The almost complete lack of logistics visibility during the initial buildup phase of the campaign necessitated the suspension. This wartime suspension lasted until November 2004, however implementation continued through at least 9 December 2009. [89] This suspension involved all Army equipment and regaining accountability is proving extremely difficult and expensive. In addition, container detention charges through December 2006 indicate that at least the system for maintaining visibility of containers needed improvement.

Issues with the recent OIF deployment are yet another example of recurrent logistical problems.[90] Although not as important as the logistics transformation of Just-In-Time, contributing factors of training, mobility rate and capacity prevented the return of supply to

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[88] LTC Jacqueline E. Baehler, interview by author, Ft Leavenworth, KS, January 10, 2007.

A complete list of factors and mitigations can be found during Operation Iraqi Freedom in *On Point,* 408.

[89] U.S. Army, *2010 Posture Statement* (Washington, DC: Department of the Army, 2010), https://secureweb2.hqda.pentagon.mil/vdas_armyposturestatement/2010/information_papers/Property_Accountability.asp (retrieved 4 March 2010)

[90] Brian Newberry, "To TPFDD or not to TPFDD Is the TPFDD Outdated for Expeditionary US Military Operations?" (Fort Leavenworth, KS: SAMS Monograph, U.S. Army Command and General Staff College, 2005), 13.

Desert Storm performance levels once accountability controls lifted. These factors did not improve in the interwar years, and in fact, the changes instituted only made the problem worse.

One of the contributing factors, training, remained the same. "As REFORGER assisted the Army in preparing for Desert Storm, ten years of rotations by units from each of the armored and mechanized divisions of the Army into Kuwait, combined with more than 100 rotations to the NTC in the Mojave Desert, built expertise across the Army in desert combat."[91] These exercises did little for logistics and suffered from the same logistical issues as thirteen years previous and in fact because of the reduced scale, exercised logistics less than REFORGER. The scale of the logistics units involved in the exercises was the brigade level, not at a combined three brigade or Division level as in 1983. The facilities used to deploy remained world class; however, much smaller than those used in the actual deployment in Saudi Arabia. So, when OIF started the increased forces were forced to move "though the relatively smaller Kuwaiti ports."[92] Unlike REFORGER, where the timeline was acceptable for reserve mobilization, fewer reserve forces participated in Intrinsic Action.[93] The NTC rotations were also smaller and required little if any participation by reserve forces. Finally, while West Germany mitigated the greatest logistical requirements in the REFORGER exercises and Saudi Arabia mitigated the deployment of Desert Shield, the Kuwaitis were unable to provide host nation support for the sheer magnitude of the deployment in OIF. This was due to the size of their nation and the political consequences of their involvement, compared to Saudi Arabia. Although critical to the operation, the Kuwaiti government provided refined petroleum products, which made that piece of the logistical problem an unqualified success.

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[91] Fontenot, 29.

[92] Fontenot, 408.

[93] Intrinsic Action was the continuous battalion size exercise in Kuwait starting in 1992 through 1999. Units spent four months in country training with the Kuwaitis.

The use and deployment of heavy forces, like aircraft, are most constrained by the limiting factor of Class III, specifically fuel required for movement, due to high fuel consumption. Operations in Iraq during OIF benefitted significantly from the availability of fuel in Kuwait. Despite the relatively close source of fuel, over 500 trucks a day carried fuel north into Iraq. Although the US contracted these trucks, they were available in the numbers required and due to the shortened distance were able to provide sufficient support. During Desert Storm, the equivalent amount of transport was needed just for the initial push north, into Kuwait and Iraq.[94] After the fall of Baghdad, when trucks had to travel over 120 miles, the required amount of trucks doubled, due to driver fatigue and refueling requirements.[95] Even with the virtually unlimited supply of fuel from Kuwait, the difficulty of these efforts required significant coordination and non-doctrinal solutions.[96] If the operations were conducted farther away from a source of fuel, or without the support of the Kuwaiti government, this operation would have required exponentially more tanker trucks and fuel tankers arriving offshore.

The increase in PREPO and sealift did not directly result in an increased mobility and capacity rate due to the limited capacity of the Kuwaiti ports. The timeframe for the deployment did not last as long as Desert Storm due to the decrease in supplies pushed as discussed previously. To mitigate the shortfall, US forces used JLOTS to augment the Kuwaiti Naval Base Pier (KNB). Delays caused by waiting for the additional units and equipment transiting from CONUS required to operate at full capacity the ports and KNB.[97] This included the mobilization and deployment of reserve personnel for theater opening units. Despite the increase capability in

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[94] Bryan Bender. "Pentagon Study Says Oil Reliance Strains Military." *Boston Globe*, 1 May 2007, A1 continued on A13.

[95] The range of the M915 is 300 miles with a 118-gallon tank. Planning for combat conditions requires trucks to have enough fuel round trip to make it to their refuel point with idling stops along the route.

[96] Fontenot, 408, 409.

[97] Ibid., 411.

PREPO, much of the equipment used in JLOTS still deployed from CONUS. This equipment is not stored in PREPO stock due to its low density. As an example, the deployment of LCUs and LSVs, which although not used in JLOTS during DESERT STORM were used in other areas, shows the delay in logistics capability.

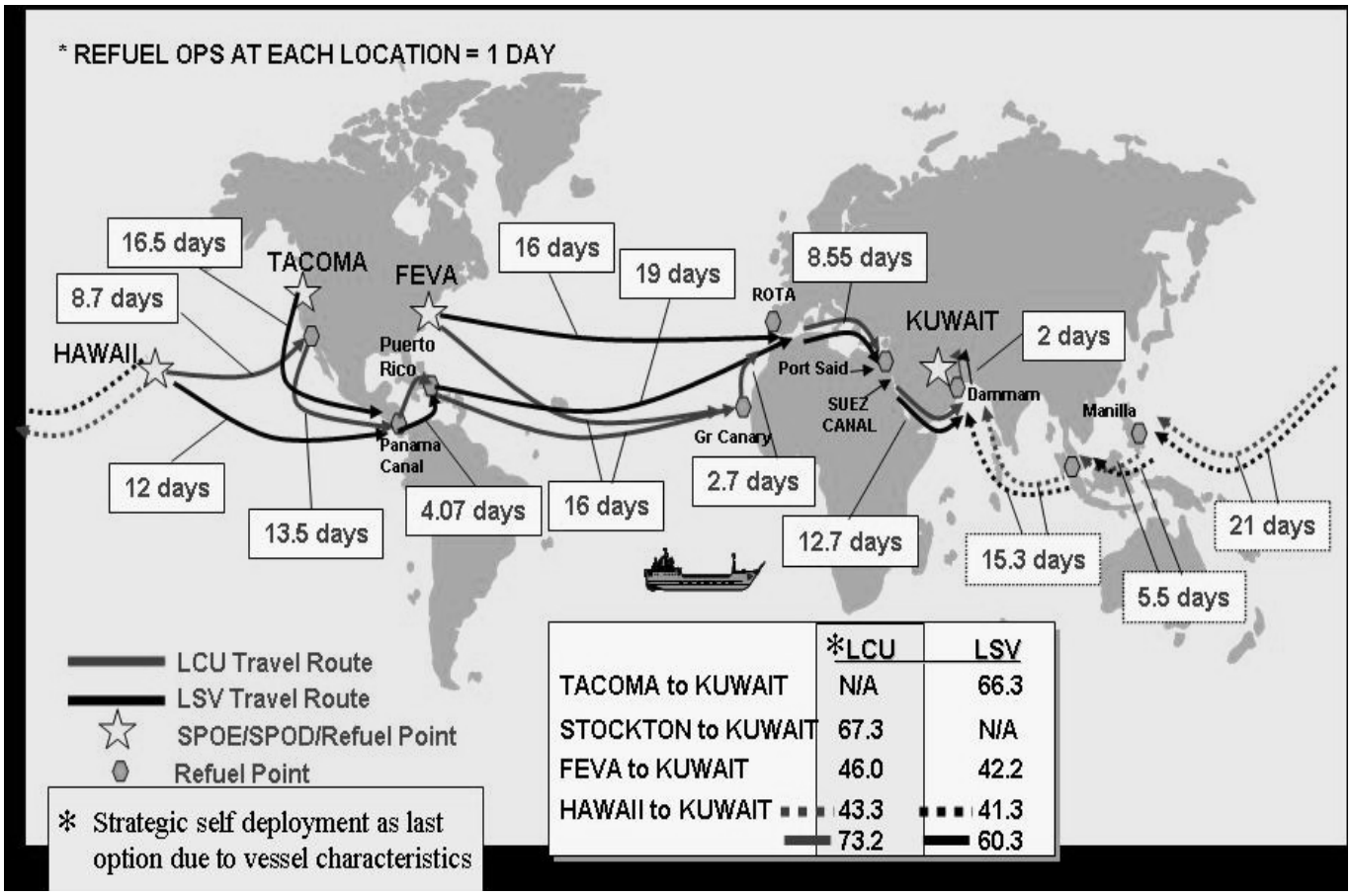

Figure 5. Deployment Times. Source: Adapted from JLOTS Planners Handbook, 2002.

Just as in the Civil War, Vietnam and Desert Shield, the US and Kuwaiti Governments made extensive use of contractors to counter the lack of capability in logistics forces especially transportation. An increase in the outsourcing of logistics began during Bosnia and increased following the appointment of Donald Rumsfeld as Secretary of Defense. The basis of this decision and the subsequent contract management issues, performance, and cost is outside the scope of this monograph however; the issue of the number of contractors, and the burden placed

on the logistic system is germane. During Desert Storm, approximately 9,200 contractors deployed. When Central Command finally made an accurate assessment of the number of contractors in late 2006, they numbered 100,000 versus approximately 140,000 troops. Previously the Pentagon released the number as "25,000 security contractors."[98] This number increased most likely because of better accountability as the war continued. "As of early 2008, at least 190,000 private personnel were working on US-funded projects in the Iraq theater, the Congressional Budget Office (CBO) survey found. That means that for each uniformed member of the US military in the region, there was also a contract employee – a ratio of 1 to 1."[99] This increased from a ratio of 8 to 1 during Vietnam.[100] The ability to maintain accountability of contracts, determine the number, and provide logistics to the contractors is germane to any discussion of logistics. Due to the unprecedented size of the contracted force, it is critical.

As the operation in Iraq winds down two facts become clear. The cost, duration and enormous size of the operation was unexpected and overwhelmed the logistics system. Despite the lessons of Desert Shield - Desert Storm, the efforts made to limit the amount of supplies forward and increase the velocity in the system have been overwhelmed by the natural impulse to move as much forward and provide the best accommodations and equipment for the Soldier. The Marine Corps has many of the same issues and is currently trying to get back to expeditionary warfare with less accommodations and a smaller footprint. Whether this attempt works better than trying to limit the size of the vehicles remains to be seen.

The size and cost of facilities exploded beyond what existed in WWII. Due to the threat of bombardment, facilities were more numerous and spaced apart from each other. Due to force

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[98] Renae Merle, "Census Counts 100,000 Contractors in Iraq" *Washington Post*, 5 December 2006, http://www.washingtonpost.com/wp-dyn/content/article/2006/12/04/AR2006120401311.html (retrieved 28 April 2010)

[99] Peter Grier, "Record number of US contractors in Iraq" *Christian Science Monitor*, 18 August 2008, http://www.csmonitor.com/USA/Military/2008/0818/p02s01-usmi.html (retrieved 28 April 2010)

[100] Ibid.

protection concerns of sabotage and terrorist activities and complete air superiority, these facilities consolidated in Iraq and Afghanistan. In Operation OIF and OEF, material entering theater routed through large Forward Operating Bases (FOBs) similar to the large bases during Vietnam. The size of these compounds is enormous with the corresponding costs of maintaining them and improving those rises into the billions of dollars. These FOBs are supported by larger facilities in the region. One location in particular has a Striker refurbishment facility, medical logistics holding, a large PREPO equipment base and numerous other support facilities with over 36.3 acres of warehouse space. The total cost for this location in improvements alone is $1.6 billion for ten years and growing.[101] Leasing costs are another concern for land-bases. The cost to lease Camp Lemonier, Djibouti for one year increased from $31 million in 2004 to $50 - $75 million a year.[102] [103] The cost of operation will reach $295.2 million by April 2011.[104] The cost of military construction at Camp Lemonier in 2010 will exceed $41 million.[105] Many of the stocks kept in these locations never move forward to the front lines. Part of this is due to the fact that these stocks are not single use for OIF/OEF, but for future contingencies in the Area Of Responsibility (AOR). In most cases, equipment that shipped over and is no longer needed, i.e. 2-1/2 ton trucks and their associated Prescribed Load List (PLL), exceeds the value of transporting

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[101] http://www.globalsecurity.org/military/facility/camp-as-sayliyah.htm retrieved 5 March 2010.

[102] United Nations Development Program. Integrated Framework Diagnostic Study of Integration Through Trade, (Geneva: World Trade Organization, Integrated Framework March 2004) ii. http://www.integratedframework.org/files/Djibouti_dtis_March04.pdf (retrieved 28 April 2010)

[103] NAVFAC EURSWA "Europe and Southwest Asia Upcoming Workload Projections" (Norfolk: Naval Facilities Command 10 June 2009) 12. http://www.ascenorfolk.org/NAVFACForum09/Handouts/1110-1155%20MR4A%20%20NAVFAC%20Europe%20One%20of%20Two.pdf (retrieved 28 April 2010)

[104] Defense Industry Daily "Djibouti, Africa: Base Operations Contracting" 30 March 2010 Accessed at: http://www.defenseindustrydaily.com/up-to-1407m-in-djibouti-for-pae-03301/ (retrieved 28 April 2010)

[105] U.S. Government. "Military Construction And Veterans Affairs And Related Agencies Appropriation Bill, 2010" (Washington DC: U.S. Senate Report 111-40 Printed 7 July 2009) 103. http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_reports&docid=f:sr040.111.pdf (retrieved 28 April 2010)

back to CONUS. Because the cost of shipping back to CONUS exceeds the value, these items stay at the facility until sold at rock bottom prices or gifted to foreign nations.[106]

In addition to the cost of materiel not used, the cost of frustrated cargo is staggering. The tracking technology improvements after Desert Storm were aimed at the reduction of frustrated cargo. This has not happened. Thousands of items are frustrated each day during OIF and OEF at places ranging from the defense supply centers, to the CONUS trans-shipment points, through Defense Distribution Kuwait (DDKS), and resource bases such as Arifjan, Al Asad, Balad and Baghdad. At each stop or transload point, the chance of the cargo becoming frustrated increases. Frustrated cargo does not reach its source, triggering reorders and multiple transports. During Fiscal Year 2005, Coalition Forces Land Component Command (CFLCC) tracked one CONEX of toilet paper as it made a trip from Arifjan to Balad three times.[107] Frustrated cargo also degrades the shipping priority system as units increase the priority for supplies in anticipation of supplies not arriving as requested. CONEX costs and detention charges increase sharply to $189 dollars a day after 90 days. During the months of 2005-2006, daily CONEX retention charges were over $10 million dollars a month.[108]

Material and transportation costs are similar to those in Desert Shield. One of the major costs that are not accounted for in current operations is the fast airlift cost that would be mitigated if supplies were moved into theatre on schedule. Airlift costs for the C-17 currently $7,975 a hour or $1,380 a ton minimum charge.[109] Airlift consistently is far more expensive then sealift. With

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[106] Author's personal experience CFLCC C4 Battle Captain October 2005 - December 2006. For example, the commercial shipping cost to Sierra Army Depot from Baghdad 2006 was $3,600. This figure was used daily during the development of the retrograde plan.

[107] Ibid.

[108] "840th Distribution Deployment Support Battalion" insert *Army Logistician Magazine*, May - June, 2006. 57.

[109] U.S. Transportation Command, *2010 Rate Guidance* (Washington, DC: U.S. Transportation Command, 1 October 2009),

an estimated 264,839 short tons of equipment priority air lifted in 2009, compared to 159,462 short tons during Operation Desert Storm in 1991, the dependency on airlift and thus the cost is increasing. With approximate costs during OIF/OEF approaching $5.6 billion, the true cost of the supply-based logistics combined with the distribution-based logistics requiring airlift and contracting support becomes apparent.[110]

OIF repeated and magnified the logistical issues of Desert Storm. The historical shortfalls of transportation equipment, logistics personnel, and the continued lack of early entry command and control of logistics remain an issue. The combination of cost cutting measures designed to address the 'iron mountain' of supplies, combined with the increase in sea and airlift compounded the problem. To a lesser extent, the historical issue of accessibility limited options to mitigate the shortfalls, however, the issue of capacity prevented the system from recovering as it had in Desert Shield. Contracting was again used to mitigate the shortfalls and maintain a "just above subsistence level" of support.[111] The longer length of the war exacerbated the existing shortfalls and this increased the amount of contractors compared to Desert Storm however both the length and cost in inflation-adjusted dollars is comparable to Vietnam. This despite an eight-fold increase in tonnage shipped. The cost of storage, loss due to mishandling and obsolescence and the increased contracting is staggering.

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http://www.transcom.mil/j8/fy10_rates/FY10_SAAMs_JCS_Exercises_and_Contingencies_Rate_Guidance.pdf (accessed 25 April 2010).

[110] Appendix 8 and Matthews, 86

[111] Ibid., 408

Case Study Analysis

The three case studies highlighted the logistics problems that developed through the way the US prepares and goes to war from WWII through OEF/OIF. Despite attempts to mitigate the issues through new techniques and methods of increasing movement, the main problems of logistics command and control, and the capacity to move, store and account for materiel early and throughout the process in each of the conflicts did not change. Logistics command and control has been largely ignored to the detriment of combat operations. As we have seen in the case studies, the specific problems arising continuously fall into three categories command and control, visibility, and capacity. Other issues of security of supplies and the effects of contractors are important but extraneous to the main issues.

Command and control issues seen in the case studies show a lack of planning for logistical considerations, delayed entry of logistical forces and no single log authority or worse an *ad hoc* log command and control structure created during or after the deployment. In WWII, the lack of a logistics command and control structure in the UK, then again in the North Africa landing, caused decisions made by a combat force ill equipped to make logistical decisions. In Lebanon, the logistics force was not even able to see the plan let alone participate in the creation of it. The logistics command and control was assembled a month before the operation and given limited control over it. This repeated in the landing at Inchon when the logistics command and control was not part of the planning process until three weeks prior to the operation. Again, the logistics force did not have directive control of logistics forces or issues. During Vietnam, logistics command and control was again fractured, *ad hoc*, and unable to participate in logistics decisions. Desert Storm did not have a logistics command and control until the logistics personnel in the existing headquarters were put together as the 22nd Support Command. This *ad hoc* organization was created after the fact and unable to perform the task assigned. This was in spite of the fact that, for the first time, planners had a detailed deployment plan built prior to the

operation. Unfortunately, the plan and the controls established were overwhelmed and were abandoned early in the deployment. This was rectified in Operation Iraqi Freedom with the establishment of the 377th as the logistic headquarters before the operation began. Unfortunately the 377th was not full strength until after the start of ground combat and thus unable to perform within the system that required total asset visibility from the beginning of the operation. As the case studies show, a lack of planning for logistical considerations, delayed entry of logistical forces, and no single log authority has been present since WWII.

Without logistics command and control, visibility is limited. Even if there had been command and control in each period reviewed, the supply visibility was lacking or nonexistent. As explained in the case studies, supplies shipped from the US left without proper documentation. Once they arrived in theater, they always required sorting. Containerization has compounded this problem. Ports and warehouses are overwhelmed by the requirement to move and sort this materiel and this problem has become worse since WWII. Efforts to impose visibility failed because of the overwhelming amount of materiel and the shortage of personnel and equipment to sort it. Contracting out these functions has not made an appreciable difference due to the additional seam it causes and the delay before contracting and host nation support is available. In addition, cost becomes prohibitive. Lost materiel triggers reorders and further overwhelms the capacity of the system. This requires stopgap measures like the Red Ball Express in WWII to the suspension of accountability in OIF. These measures are extremely wasteful and tax the distribution system further. When they fail, operations halt. Fortunately for the US, in each of the case studies, these operational pauses did not result in catastrophic failure. Perhaps this is why logistics issues continue to remain a problem despite seventy years of improvement efforts.

As we have seen in the case studies, the nation's ability to surge materiel overwhelms the Army's ability to distribute it. As means of transport became more numerous, larger, varied and more standardized, this resulted in a slight increase in throughput and a vast increase in supply sitting at the port. This is a difficult concept to understand and warrants repeating. The ability to

move more of something faster in one stage of the process is not indicative of the fact that it will move faster through the entire process. As the capacity to move more materiel in one stage of the process increases, more of that materiel will wait on the next leg of the journey. This is magnified without proper command and control and visibility. To look at it another way, capacity to effectively move materiel has decreased with the means to move it faster. Without the corresponding increases in the capacity in all phases to receive supplies, account, store and move forward the process is slower. In all of the conflicts studied, efforts to push supplies faster in more ships or larger ships or aircraft resulted in a slight increase in overall throughput and larger amounts of supplies sitting at the port. Further efforts to increase the same part of the process can be expected to result in the same issue. Better distribution throughout the system is needed.

Although the initial wave of materiel has overwhelmed the logistical capacity at the points of debarkation, sorted materiel moves forward from the port more efficiently. The shortage of ground transport has plagued the forward movement however, it is critical to understand the importance of the forward base as shown in the case studies. In WWII, the UK acted as a forward base, receiving materiel from the US and preparing it to move forward to North Africa and the Normandy landing. As shown the inability to prepare the materiel effectively for the North Africa landings was a function of inadequate logistical capacity. Once capacity arrived, the material was sorted and prepared for the Normandy landings. A similar method was used in the Pacific with land bases receiving supplies and then pushing them forward to the floating base. Saudi Arabia and Kuwait acted in this capacity during Desert Shield and OIF respectively. Despite the shortage of logistical capacity early in the conflicts, it is important to note the effectiveness of the follow-on movement. These Intermediate Staging Bases (ISB) a modern term, allowed the massive amount of materiel to arrive and be sorted while needed supplies either bypassed the ‘iron mountain’ or were picked out of it. A lesson from the case studies is that until perfect logistical visibility and command and control is established, the ISBs serve a vital purpose as a single point to receive and store materiel in excess of the capacity of the system.

These issues are not surprising conclusions. Army, Joint and Department of Defense logisticians have been working on solutions to the true problem of command and control, visibility and capacity since WWII. Due to its scale, Desert Storm led greater impetus to the search for answers for logistics issues. After Desert Storm, the realization that logistics command and control was needed early in the operation was the genesis of the 377th Theater Support Command[112]. Unfortunately, as discussed in the OIF case study, this solution was not complete. Other ideas such as intransit visibility tags on equipment and supplies were not implemented fully due to funding and lack of use and training. Just-In-Time logistics and the visibility solution of the day worked for small-scale conflicts. Due to the lack of a capable early entry logistics force and intransit visibility, accountability was not maintained in OIF. The near logistical failure of OIF has been a blessing in disguise for logisticians. After OIF, the solutions involved adding logisticians to the planning of operations, early entry of logistics forces, single log command and control, and dedicated logistics units for areas of operation. With the near failure of logistics in OIF, and the designation of TRANSCOM as the distribution manager, these ideas have urgency and a sponsor.

In 2005, the US Army logistics organization transformed into a modular force with capability to provide early entry and a dedicated logistics headquarters, the theater sustainment command, for each combatant command. The TSC provides a single logistics authority to plan, command and control, and move logistics within a theater. Currently in OEF/OIF, this is the unit in Kuwait. In the case of multiple conflicts within a theater, the expeditionary support command (ESC) provides hands-on capability and forward command and control. This is the unit in Balad. Attached to these units are forces designed to provide early opening capability, movement control, and materiel handling. One of these methods of command and control and movement is JTF-PO. Although a TRANSCOM, hence DOD unit, JTF-PO provides early entry capabilities

[112] Units of this type are now called the Theater Sustainment Commands.

described earlier in the methods section and works directly with the TSC. The creation of a single logistics command and control structure with the ability to react quickly and maintain control has been a long time in the making. The issues of ad hoc logistics formations or no logistics headquarters appears on the surface to be solved.

Unfortunately several issues remain. The TSC and ESCs are composed of a mixture of active and reserve forces. As in the past, reserve forces take time to mobilize, and as we have seen during Desert Storm and OIF, the ability of these units to move quickly into theater and begin their mission is suspect. Under this structure, many of the units that perform the missions of moving the supplies are reserve units as well. In addition, TSC and ESC units are smaller than the historical units that performed the same mission. This decrease in size is made possible by the use of electronic enablers. The units are currently augmented to perform their mission until fielding of the enablers is complete. The question remains, will the enablers allow the unit at its present size to perform the mission? As we saw during the beginning of OIF, the lack of visibility was a key factor in the less than unqualified success of logistics.

Improvements in visibility increased as well. The issue of visibility being real time accessibility below the brigade level has been addressed. TRANSCOM is developing a system, used on the network by combat forces, to provide real time data. The continued development of existing visibility systems has become far more effective in the placement and usability of the data. For example, logistic units now use the same GPS tracking system as the combat units permitting not only visibility, but force protection as well. Shipping points in CONUS and other services areas of responsibility have improved the use of these systems as OIF continued. Intransit visibility appears to have taken great strides in the last five years.

However, concern remains that development of a system in a mature theater does not equal the strain that a system undergoes during deployment. As described in the case studies, all the conflicts had systems for visibility prior to deployment, whether paper or electronic. The critical element was the limited or non-use of these existing systems and the resulting effect on

capacity. In addition, with the delay of logistic force deployments the ability to set up the personnel to receive or deploy the electronic receivers in a large-scale deployment like WWII, Korea, Desert Storm and OIF did not happen. In the case of Desert Storm, the system managed in the US was not able to handle the amount of information effectively and was set aside. These issues must be trained to scale to determine if the improvements are capable of handling the load of a deployment scenario.

As the case studies show, the logistics problems that developed as the US prepares and goes to war from WWII through OEF/OIF have been addressed. Despite attempts to mitigate the issues through new techniques and methods of increasing movement, the main problems of logistics command and control, and the capacity to move, store and account for materiel did not change. Current efforts must address the unique strain of the deployment atmosphere in a large conflict before they can be assumed as a solution to the problem. Otherwise as in OIF, these solutions create problems of their own.

Future Concepts

Given the difficulties in basing, and the dependence on deteriorating infrastructure combined with the Army's reliance on this same infrastructure, it is natural to try to move away from fixed bases toward seabasing. The Marine Corps, a maritime-based force, began to promote seabasing as a means to overcome the increasing cost of land bases. Reinforced by Desert Storm, seabasing addressed the potential danger of inaccessibility. Seabasing began in WWII as the only alternative to land basing due to the geography of the Pacific.

The decision to build the Joint High Speed Vessel (JHSV) and the resurrection of the Joint Logistic Vessel (JLV) as the former Mobile Landing Platform (MLP) in December 2009 effectively guarantees the maritime services will implement some form of seabasing. As the situation in Haiti developed in January 2010 as the textbook example of seabasing, it is likely that the concept will only gain momentum in the U.S. military. Although seabasing is gaining traction, the historical issues: efficiency and effectiveness issues in deployment and supply capability, and the transferability of these issues to seabasing will require work to mitigate. What is an additional concern is the initial deployment of forces, exactly the portion of the process seabasing will affect the most, has the greatest effect on the deployment.

With the addition of Army requirements, maritime developed seabasing grew more complex. DOD and the Army have significant interest in maintaining deployment momentum, simultaneous and sequential force flow and increased volume and timing.[113] Currently, as units flow into an area of operations, there is a significant delay for shipping equipment, movement through a port or JLOTS operation, uniting personnel and equipment and follow on sustainment. Synchronizing these actions and reducing the capability gap between light early entry forces and heavier forces remains a challenge. Whether seabasing can support these objectives in larger than

[113] TRADOC White Paper, 8.

one Army light brigade configuration remains to be seen; however the logistical impact however is becoming clear. Logistics forces need the capability to react faster in the initial phase of the deployment to maintain accountability and coordinate the effort. In addition, regardless of the final form seabasing takes, the velocity of deployment and the complexity of the entry will continue to increase. This poses a unique twist to the traditional logistical problems faced by the Army, Air Force and Defense Logistics Agency (DLA)

The difficulty in addressing the traditional issues with the current methods of deployment logistics and new challenges of increasing speed and agility requires a comprehensive approach with both culture and equipment changes. These options for the Army as it approaches seabasing are how to use the sea-base concept. The spectrum of options the Army could use to approach deployment ranges from simply passing through the sea-base and deploying as currently able, to fully embracing the sea-base, in effect, the Army deploying as the Marine Corps currently deploys. Naturally, both ends of the spectrum are troublesome given the complexity of the sea-base and the non-maritime types of equipment used by the Army. Another decision facing the Army is whether the Army treats both combat and logistic forces the same. As we have seen in smaller conflicts, the value of the logistic forces being stationed at sea or in another location means less equipment forward on the land and less need to guard supplies.[114] Even in permissive environments, the danger remains of pilferage, attack, and loss unless these supplies are located away from the conflict. Larger scale historical examples show the Army is capable of sea-based supply.[115] Rather than a new novel concept, seabasing is a concept the Army performed in the past. How to use the sea-base in the future remains the question. An evaluation focusing on the reoccurring issues in deployment and follow on sustainment is required to evaluate the suitability of seabasing in addressing these issues in the deployment of combat forces in large contingencies.

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[114] Lebanon 1958, 1982, and Kosovo 2001.

[115] Work, 49, 50. Specifically the Pacific Campaign.

The logistics impacts of seabasing are similar to those encountered with any deployment, regardless of size. Addressing these factors in the formative stages of seabasing development mitigates modifications later in the development and allows for proper scaling in larger contingencies. The range of deployment has similar historical challenges, however the speed, tempo/synchronization and capacity of seabasing adds significant potential challenges to the Army logistics community.

The potential for waste and time spent reestablishing accountability requires an improved solution even for small conflicts. Ideally, accountability is maintained throughout a deployment and only rescinded in unexpected situations rather than every major conflict. Improvements to the means of identifying supplies and the means of sharing that data in real time are being developed by TRANSCOM. Although the solutions are in their infancy, it is important to understand the problems in a historical framework to determine how the improvements will affect seabasing.

One of the concerns of seabasing is the protection of the sea-base. Of interest, critics of seabasing point to the inability to protect the sea-base as reason to dismiss the concept while ignoring the protection of the almost equivalent number of vessels required to move into the port. Regardless of what form the sea-base takes, the tankers and other parts of the Offshore Petroleum Discharge System (OPDS) will have to be protected. This protection falls to the Navy and is beyond the scope of this monograph. However the need to track, command and control the fuel once it comes ashore is fully within the Army's purview. Army logisticians are required to source the land, set up the Inland Petroleum Distribution System (IPDS) and/or storage prior to any significant movement of heavy forces.

Direct delivery has been the object of the Army and the supply system since at least the era of Desert Storm. This desire ranges from the enormous 'iron mountain', frustrated cargo, transportation bottle necks, and subsequent costs. Just in time delivery and other attempts at controlling these issues have not been realized to the satisfaction of commanders and logisticians. Direct delivery is not possible. The reason direct delivery is not possible is because one cannot

configure a unit load in CONUS at the same time and ship it directly to the unit without at least a minimum of three transload points. The material will not be ready at the same time, the technology is not in place for a unit to bulk request, and that request is not seen at the CONUS defense supply center without first discussing the availability of transportation allocated to cover every unit in the supply chain. Instead of focusing on direct delivery, the Army must focus on the ability to move the supplies as close to the fighting as possible in the correct numbers and with absolute transit invisibility. A land-basing supply in forward areas has served the military well since Desert Storm. However, land-basing developed its own set of problems. Oversupply, storing the same items in multiple overseas depots subject to cost increase, political instability and the ultimate need to move those supplies into the area of conflict has driven the Army and DLA to consider seabased warehousing. Instead of considering seabased warehousing as another step in the delivery process, one must consider it as a transition from land based warehousing in its associated issues to a seamless forward positioning of supplies. As we consider CONUS based warehousing as being ineffective to supporting the warfighter forward, we must equally view land based warehousing OCONUS as ineffective.

As the Army approaches the promise of joint seabasing, it attempts to balance existing capability with future opportunities. Logistics has current concerns preexisting with JLOTS and improved port access. Speed of deployment has been a concern and addressing how to speed logistics ability is a problem. Several changes are necessary in how Army logistics forces are arranged, deployed and employed across the spectrum of operations. As the Army moves towards seabasing with the requirement of using improved ports, the significance of JLOTS remains. If JLOTS completely transitions to a Navy responsibility under seabasing, the Army requirements must be clearly articulated.

Currently, the Army and the Marine Corps have units that can deploy quickly. These units arrive in theater and close within seven to ten days. Follow-on forces, both heavy and logistics, tend to take much longer, up to 21 days at the earliest, and are unable to conduct their

mission during deployment. By seabasing, the logistics unit is able to commence operations immediately on a platform on which they can remain until the conclusion of the operation. Across the entire spectrum of conflict, seabasing logistics units are critical to maintaining the accurate command and control of logistics forces and supplies early in any conflict. This command and control contributes significantly to the need to maintain accountability of supplies through intransit visibility and the consolidation of the information that currently requires boots on ground, and hands on material tracking. The benefits of seabasing the logistics command and control structure are immediate deployment, better tracking of material, improved tracking of logistics forces with less cost resulting from a reduction in forces and material needed.

Seabasing material also has benefits, although it is doubtful that the capability of seabasing materiel is sufficient for large conflicts. It remains viable for smaller conflicts and is highlighted for further understanding. High dollar value items and Class XII can be stored on ships in peacetime with little impact to the units themselves. In fact, this 'train how we fight' mentality will improve the way the Army issues supplies during wartime. This will lessen the need to rescind peacetime accountability rules when deploying to conflicts. This deployability is also scalable. Whereas the amount of material on each ship is tied to the brigade support for that ship, it allows separate ships to deploy to support their brigades with additional ships if a division or larger is deployed. Sea-based warehousing will ultimately act as the download points on shore and at the division and brigade level while DLA ships will act as the Defense depots and map warehouses in theater. By spreading out the supplies across different ships, the perceived increased threat of anti-access technologies is actually lowered. Whereas land based depots at the brigade, division , corps and DLA level are susceptible to both ground and air threat, seaborne stocks are only susceptible to air and sea. Arguably, the level of enemy required to take down a sea-based depot is greater than a land based one. Arguments against risking everything on one endeavor are mitigated by the dispersion of supplies and multiple ships in multiple locations with air and sea connectors. The advantage of multiple access points while maintaining one or more

large entry points is undeniable. The cost when factored against the apparent and hidden costs of land basing as well as increased airlift, force protection and container detention costs during wartime must be compared to the steady state peacetime costs. With the current, historically low opportunity cost of purchasing ships while maintaining the paradigm of smaller ships versus larger ships, cost effectiveness should be examined.

Examining the cost of seabasing command and control is difficult to quantify however, some costs are apparent. The cost of the ships, maintenance, additional transport, and refueling costs are compared to the traditional land based costs of leasing, power generation, waste removal and water production. Subsistence and sustainment of personnel costs should remain the same however. According to testimony during the 2005 Defense Authorization act,

> The commercial shipbuilding industry estimates the cost of building a new 'off the shelf' 2000 TEU containership ship in the U.S. would be about $150 million. Any modifications made to the design of such a ship to add additional military features would increase the cost. If the $150 million cost were amortized across 30 years carrying the interest rate of current Treasury 30-year bonds, the daily cost would be approximately $26,500 per day. The equivalent cost of the ships MSC currently charters is approximately $15,000 per day (the estimated asset portion of a larger "time charter" rate).[116]

A specialized ship, the Navy's new T-AKE supply ship, was awarded for $456 million in Feb 2010.[117] This figure is the ship cost itself not all of the internal systems specialized for use in an underway replenishment vessel however, it provides a baseline for a non specialized ship with a heliport similar to the type needed to sea-base a TSC. $456 million averaged over forty years, the expected life of the ship, is $31,232 per day or a little more than $11 million a year. This

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[116] U.S. Government. "Hearings on 2005 National Defense authorization act for Fiscal Year 2005, HR4200" (Washington DC: U.S. House Armed Services Projection Forces Subcommittee Report Printed 17 March 2004) 287. http://www.archive.org/stream/hearingsonnation200501unit/hearingsonnation200501unit_djvu.txt (retrieved 28 April 2010)

[117] Defense Industry Daily, "U.S. Navy on the T-AKE as it beefs up Supply Ship Capacity" (28 February 2010). http://www.defenseindustrydaily.com/usnavyonthetakeasitbeefsupsupplyshipcapacityupdated-01826/.html (accessed 28 April 2010).

compares to a land base lease at $11 million a year. Compared to the current cost of Camp Lemonier in Djibouti, the cost of seabasing a large contingent of personnel and the added flexibility gained warrants further study.

The value of seabasing is that at the beginning of a conflict there is an accurate count of supplies and demand. In all conflicts, more supplies are pushed because the initial quantities needed, shipped and used are not available. This uncertainty leads to consumers and logisticians pushing as much as possible quickly. This overloading of the transportation system prevents proper prioritization and over the long term requires the purchase of more expensive airlift than would be otherwise needed. By seabasing the command and control necessary to provide visibility, proper demand and accountability can be maintained throughout the initial stages of conflict. The initial stage being arguably the most important, sets the condition for any length of conflict required. Follow on supplies being greater in number are more easily tracked even as they come from divergent sources because of robust logistics infrastructure. This results in the status of materiel and equipment numbers and location more accurately described to the user preventing follow on orders. In addition, true demand is more accurately reflected. With units holding their supplies in their area, there are fewer tendencies to borrow from other sources and to over request. In smaller conflicts, the brigade level sea-based warehouse answers the existing issues of over requesting accountability and location to ship that currently plagues the system. In future employment, the sea-based warehouse will be better able to support conflicts on the low end of the spectrum because of its tailorability and manageability. Process streamlining in CONUS must also address these issues, but will be enabled by a set location. Just as the use of UICs enabled units to be more easily tracked CONUS infrastructure, sea-based warehousing and ISBs enables a location. Especially in the initial phases of an operation, a request to the logistics units in the chain can be immediately processed versus having to wait for that unit to arrive and assemble in theater. Ideally, a unit request as it is preparing for deployment is processed by the unit logistics structure enroute to a conflict, is sent through the CONUS distribution chain, and is

filled and moved to a set location before the unit has even arrived. With the decrease in request time, transload and location identification time, seabasing fixes without additional controls the issues that currently exist in the process.

By removing all of the TSC personnel and supplies from a land based forward operating base, we reduce the overhead required in personnel of security and movement. By not having to move the logistics units as well as the supplies, more transport is available for the combat units to move forward as well as resupply local units. This, in effect, achieves the reduction of 'tooth to tail', which the Army as well as the other services have been trying to achieve throughout history, without a corresponding lack of capability. The establishment of firebases in Vietnam enabled remote locations to provide indirect fire around the country. The heavy lift ability of the helicopter allowed these remote locations to be resupplied. Prior to the development of this concept ground supply dictated the locations troops could be stationed. Regardless of the outcome of Vietnam, the technological advantage enabled logistics techniques that allowed greater freedom of maneuver. In a sense, the Vietnam firebase concept can be used on a larger scale with the seabasing concept. Over time, a potential reduction of ground transport assets in the division and higher will be realized. This in itself is enormous gain in efficiency for logistics.

In order to make a decision regarding items in a sea-based warehouse, the following costs must be aggregated and counted against the cost of any sea-based warehouse. The cost of basing, both leasing the land and upgrades, the political risk and subsequent cost, standing inventory, increased CONUS return shipping costs and costs associated with inaccurate tracking and accountability (frustrated container costs, redundant shipping, over shipping, expired product, pilferage, and destruction due to elements). By maintaining constant visibility on individual items with single source access and worldwide visibility, significant savings are realized. Once these costs are factored, they must be balanced against the costs of seabased warehousing, the ship, maintenance, refueling and the cost of additional connectors and platforms needed to make the ship based movement.

Seabasing is a concept that has potential for the maritime services but is not developed sufficiently to sustain the amounts of material required in high intensity conflict. Differences in Army equipment, posture, and deployment prevent seabasing forces until sufficiently mitigated. The Army will have to make modifications to use seabasing in the future. Until then the Army needs a solution that works across the spectrum of conflict and will fit into the seabasing concept if that becomes a viable option for the Army in the future. Land bases will continue to be required due to the size and velocity of modern logistics demand. Seabasing cannot adequately address this constraint. The solution is for the Army to sea base the command and control of its logistics elements reducing demand because of increased visibility and permanent attachment to the materiel and influencing location of supply depots. The historical record supports certain classes of supply should be seabased. Command and control units must control early deployment from the position they will occupy throughout movement while allowing other units to occupy prepositioned sets. This solution provides early entry capability and continuous coverage without the additional burden of increased footprint.

Conclusion

This monograph explored the historical issues in the distribution process by describing the interaction between distribution methods with the use of historic, contemporary, and future case studies. These case studies delineated the development of logistic issues and the methods employed to address those issues. The discussion in detail of the methods and issues highlighted the interaction of these relationships. The distribution methods discussed in this monograph are the land-base concept (basing), regular transportation by either air or sea (bulk shipping), Joint Logistics Over-The-Shore (JLOTS), Prepositioning (PREPO), Joint Task Force Port Opening (JTF-PO), and the sea-base concept (Seabasing). These methods traditionally viewed in isolation are interrelated and studied in a holistic manner in the paper. This paper is timely due to the establishment of TRANSCOM as the Distribution Process Owner and the development of the seabasing concept. The paper answers how the six distribution methods in combination with the additional assignment of logistics command and control to the sea-base can mitigate historical logistics issues and avoid the unintended side effects of past solutions.

The three case studies highlight the logistics problems that developed from WWII through OEF/OIF. Despite attempts to mitigate the issues through new techniques and methods of increasing movement, the main problems of logistics command and control, and the capacity to move, store, and account for materiel early and throughout the process in each of the conflicts did not change. New developments of personnel no longer deploying with their equipment, additional weight and volume of materiel only add to the existing issues. The often-cited growth and cost of contracting and host nation support is only indicative of existing issues in capacity not a new issue. The problem is how to ensure logistics command and control is robust and present early in the deployment, has the authority to decide logistics issues, has the visibility to make those decisions, and the capability to perform the necessary tasks.

The conclusion of the analysis is how to address these issues. In doing so we need to address four assumptions: One, RSOI will remain a part of the Army's deployment plan and combat units will continue to need logistic units. Two, the logistics elements will have difficulty maintaining priority of movement into theater and set up prior to the combat units. Three, efforts to improve intransit visibility will improve but still require hands on verification. Four, the largest deployments are the difficulty and any solution needs to address these first. The first two assumptions require logistics units to be able to support prior to the arrival of combat units. The third assumption requires the placement of units ideally at the point of origin of materiel before shipping or at the point of debarkation with enough capability to sort the massive influx of materiel. Units at the point of debarkation would require sufficient space to accommodate what amounts to a transload point. The fourth assumption requires enough capability to perform these functions at the levels seen in Desert Storm and OIF. This assumption is problematic because it requires sufficient capability maintained during peacetime to react early in a conflict. Historical examples show the ability to mobilize fast enough to manage the wave of material effectively does not happen, and thus is unlikely to occur in the future. It is fair to assume that fiscal constraints prohibit the maintenance of a large logistical overhead. Thus, existing methods must be used to mitigate this eventuality.

To overcome these logistics constraints all of the methods of distribution must be used to gain speed during a deployment. This thought while not revolutionary is critical to understanding the historical issues of logistics. As discussed in the case studies, new methods historically have not received the funding necessary to fully implement them. Using a combination of existing methods to reduce the friction between them and gain time in the use of each method is the preferred technique.

Linking the logistics command and control for an operation is the TSC. The TSC provides single logistics oversight and linkage back to CONUS and Army Service Component Command (ASCC) logistics infrastructure for the entire operation. This element must be in

constant communication with the status of materiel and its movement. This can only be achieved by remaining in a static location. The unit performing this function, traditionally has been located on a land base. If the land base is in the theater of operation, the effects have been mitigated. In Korea, the distance of the logistics command from the peninsula proved problematic. In Desert Storm and OIF, the time zone difference and the echeloning forward to mitigate the issue proved problematic as well. Eventually, all the daily accountability tasks, short term planning, and decision makers moved forward while the long term planning remained in the CONUS site. The TSC requires daily validation of incoming materiel and eventually collocates with the entry point of materiel to conduct this hands-on accountability of its subordinate unit actions. If the land base is in another AOR or CONUS, the TSC and ASCC move forward losing control of the operation. If the capability of the TSC is in the reserves, the delay causes loss of control of the operation. The TSC must remain in a static location in the AOR. If the TSC cannot be located in the AOR due to political reasons, the TSC must remain in a static work environment able to move to the AOR. Due to the size and connectivity requirements, a designated lift is the optimal solution. The early capability required to provide hands on management already exists in the JTF-PO. This capability is robust for early entry operations and fast enough to react before the loss of accountability occurs. Unfortunately, the capability is not sufficient to handle a large enduring operation. The TSC and its coordinating elements arriving within a twenty-day sailing time, combined with the JTF-PO reporting to or thru the TSC provides this capability in command and control. [118]

How does this differ from today? The TSC must pack, load, move, download and set up in the new location. Doctrinally, the TSC moves in echelon; however, this has not been the case in the past. As the case studies show, the ability in each of the conflicts for the logistics forces to gain priority during the initial deployment is nonexistent. During this movement, command and

[118] JTF-PO is capable of supporting itself for at least 45 days

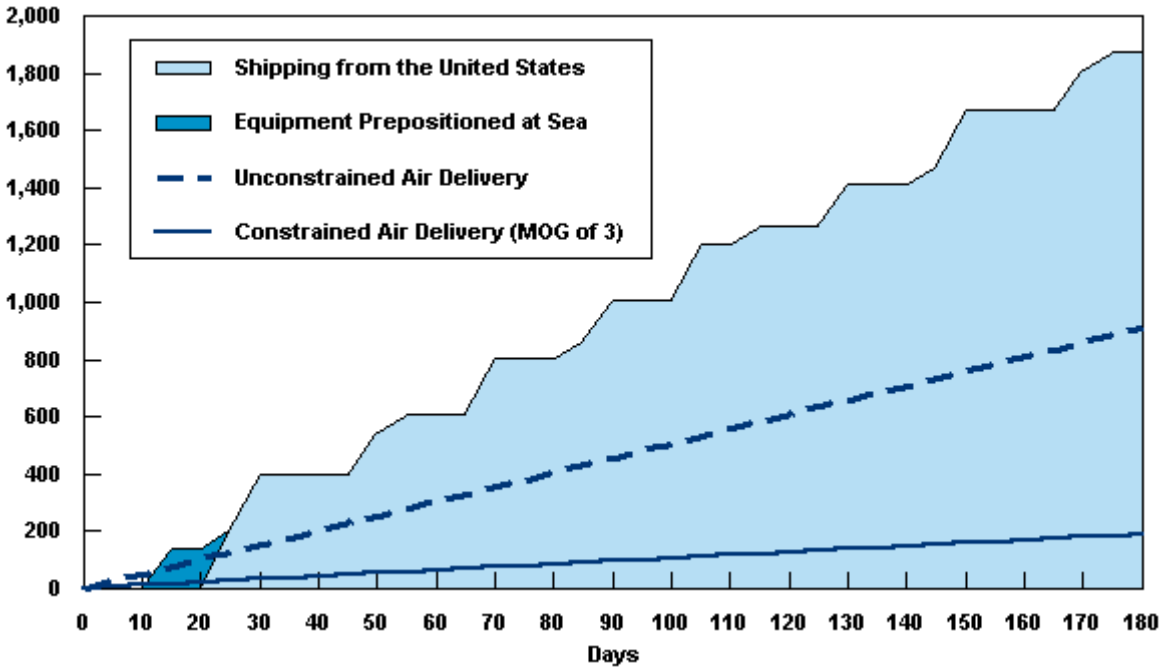
control is significantly degraded. JTF-PO is designed to be able to overcome this priority gap by remaining a TRANSCOM asset. Unfortunately, it is unable to perform the coordination and planning tasks resident in the TSC due to its size; however its size and command sponsor affords it the flexibility to move into a theater quickly, unlike larger logistics units.

What about coordination? The TSC must collocate with other higher level units and ideally with the logisticians of the Army Service Component Command. These units echelon forward as well. Each of these units already have forward command posts or response elements that move to sanctuary near the conflict. Consolidation of this group as a package that moves together simply acknowledges the fact that they must work together. Tying the ability of JTF-PO with the existing logistics infrastructure maintains the link between TRANSCOM and JTF-PO. The organizations already exist to implement this solution.

The issue of capability in the reserves appears problematic and must be addressed first. As we have seen in the development of JTF-PO, sufficient capability must be able to move immediately to arrive before the air and sealift arrives. The window of time between the initial prepositioning loads and follow on material from CONUS is twenty-one days. Several days prior to this phase, the full capability of the logistics unit must be in place. With the delay in mobilization of a minimum of two weeks, this limits the window of availability of these personnel. High priority transportation for equipment has traditionally not been available to move into the theater. The limit remains at the theater POD. Airlift results from Desert Storm and OIF show that without equipment, personnel can be moved. The timeline dictates that reserve personnel must be integrated with their equipment prior to becoming operational. Thus, the limiting factor is that equipment and facilities must be in place prior to the arrival of the personnel. As shown in the figure below, the timing of a deployment using reserve forces early in the conflict is possible and remains preferred as long as the initial capability is present.

Amount of Equipment Deployed over Time by Airlift or Sealift

(Thousands of tons)



Source: Congressional Budget Office May 2005.

Notes: MOG = maximum on ground (a measure that represents the number of cargo aircraft that can usefully be accommodated at an airport at any one time).

This figure shows deliveries from Savannah, Georgia, to Djibouti in East Africa using 180 C-17 aircraft or Military Sealift Command's fleet of fast sealift ships and large, medium-speed roll-on/roll-off ships. Prepositioned equipment is assumed to come from Diego Garcia in the Indian Ocean.

The factor of reserve personnel in logistics units is not an issue as long as the capability exists to maintain command and control prior to their arrival in the first twenty days and the equipment and facilities are in place.

The synthesis of this concept is that the logistics elements involved in a deployment must be able to conduct their operations without delay or interruption. The case studies show that logistical command and control early in the conflict is essential. Once we accept this obvious fact,

the question remains how to operationalize it. The first option is to provide dedicated lift for all the logistics elements at the start of the conflict and the reserve forces prior to the twenty-day mark and the facilities and equipment to perform their mission upon arrival. This option has not worked in the past however with increased emphasis may work in the future. The second option is to provide a platform for the personnel to join their equipment. This second option shows promise; however it requires changes to doctrine and culture and carries certain risk.

Seabasing the TSC and its logistic partners in command and control has the benefit of providing dedicated lift early in the deployment, and reserve forces mobilized after the departure of the ship can be introduced along the route with little or no interruption. The command and control itself is uninterrupted and remains able to use its own equipment. The time line for deployment is faster and less fragmented. Ships are capable of housing the forces and connectivity has improved to provide a continuous link between JTF-PO and the CONUS logistics base. The detriments of seabasing are similar to land basing. The initial cost of ships, maintenance, and sustainment compare favorably with land bases *without fixed wing airfields*, but without the political concerns. The force protection concerns resulting from the concentration of forces on a few vessels are similar to those of land bases, with the catastrophic vulnerability of the ship remaining a concern. Just as certain ships were afforded extra protection during Desert Storm and OIF measures would need to be in place to prevent catastrophic consequences. Similar protections provided to land bases are required except at sea and redundant capability as used with communications nodes in Iraq would be needed as well.

Seabasing logistics command and control forces significantly reduce the setup time of the units controlling the download. The command and control would work concurrently with the JTF-PO capability and subsume these responsibilities faster than the current timeline. The effect of the early entry of continuous logistics command and control reduces the amount of material shipped and increases the efficiency and effectiveness of the logistics process throughout the campaign. If deployed by sea, these units would be able to perform their functions before their physical

presence arrives in the area without a pause. Seabased logistics forces must work aboard prior to the start of conflict and must be able to control, in route, the massive amounts of material required early in the deployment to prevent longer-term issues. Current command and control systems and connectivity being used in OIF and OEF can be installed on the ships.[119] The use of existing systems, not special sea-based systems, is critical if during the course of a conflict the logistics unit must disembark. This does not mean that a logistics unit could begin operations in garrison and move to the ship during deployment. However, it is expected that this will be tried. Units that set up and work from a sea-based platform will encounter issues unique to the unit, as well as to the concept, and work them out prior to deployment. Moreover, perhaps most importantly, as the historical examples show and logic dictates, using a different command and control system or even conducting operations in a geographically different location encounter significant difficulties when applied to the difficult task of a fast moving operation under the lens of a 24 hour news cycle.[120] Stationing these command and control forces aboard ship during peacetime mitigates this issue as the same facilities are used throughout the operational cycle.

As seabasing command and control assists in the deployment process reducing the amount of additional supplies, more work must be done to mitigate the issue of port congestion. As the case studies show, ground transportation was lacking. This transportation must be present in sufficient quantities, early in the deployment process to clear the port. In Desert Storm and OIF, the material handling equipment and personnel were lacking early in the process and materiel built up and slowed follow on element's attempts at clearing the port. Contracting these solutions takes time and is not able to mitigate the issue early in the process. Additional

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[119] See Appendix 9.

[120] Another example not included in the case studies is the lack of A/C units in the Costa Rica 08 JLOTS exercise. None of the electrical equipment used in command and control could be used because cooling equipment was not available. The unit was based in a northern climate and had not conducted an operation before in the high heat.

transportation and material handling equipment must be placed in APS stocks to augment JTF-PO. This has the added effect of increasing the time before JTF-PO is overwhelmed and may lead to a seamless transfer to contracted support over time.

As the case studies show, capacity is a limiting factor. Although enabling logistics command and control earlier in the conflict increases visibility and reduces the reordering of materiel, in a sense increasing capacity by reducing demand, the massive wave of materiel shipped from CONUS, the supply side of the equation remains. The problem of managing this wave of materiel has been successful in several instances within the case studies. The ISBs provide an entry point in theater to stock materiel until sorted. Efforts to improve the demand side (i.e. logistics command and control and visibility) may not be completely successful or may fail from previously unforeseen circumstances. Any solution will require the retention of ISBs or land bases to receive material in excess of the logistical systems capacity to receive it. These ISBs must have the ability to receive and sort large amounts of materiel and not require additional preparation or the use of JLOTS. JLOTS equipment is limited and requires significant time to set up making it less then the optimal solution for early deployment. It is highly doubtful that significant capacity for large scale operations such as Desert Shield and OIF can be reached in the sea-base due to fiscal constraints. This uncertainty alone justifies the retention of land based capacity in the future.

This solution consists of continuing the synchronization of all six methods of distribution, establishing true enduring joint ISBs, using seabased command and control and selected classes of supply by brigade set, and placing additional early opening and ground transportation in APS and at the ISBs. These additions work within the existing framework to mitigate the historical issues associated with logistics. By including a holistic solution to individual issues that have been addressed in the past this paper provides a timely addition to the logistic debate on these issues.

These recommendations drive the conclusion supported in this monograph that at least some logistics headquarters must be located on ships. The introduction of military transportation, command and control, and the faster setup of POL will reduce the delay in sustaining the heavy forces required in larger conflicts. Heavy forces themselves can move faster from the port into position. The resulting efficiency reduces the amount of equipment and footprint needed to conduct a similar operation using today's means. In addition, certain classes of supply must be stocked on these ships while other classes are not as critical and more dependent on the cost of seabasing these supplies. Overall, the initial upfront costs of seabasing command and control are more than offset by the reduction of land-based costs and the increased flexibility inherent in seabasing. The Army stands to gain much from seabased warehousing, its logistics force, and supplies. TSC units as well as Army subcomponents and Defense Logistics Agency assets stand to gain from placement on mobile platforms. Such employment must begin as a regular concept, not just used exclusively in war. This employment does not include the supporting units; however, their equipment must be placed in APS for early access. By using two TSCs and two ESCs, and three sustainment brigades that are near existing ocean ports, the units can operate off the ships and be able to sail in the early stages of a conflict. With current connectivity, the units adopt the same speed of employment as the Marine Corps MEUs. Moving toward seabasing logistics units and supplies will require a significant culture change within the Army. This process should take place methodically after significant study. The decision to place initial units should focus on one TSC near the coast, then one ESC and a sustainment brigade located near the coast. After the trial period, an additional sustainment brigade headquarters would be next. The intent is to condition the units to operating aboard without losing focus as a ground based force. This proof of principle must focus on command and control, supply classes to store, and connectivity with JTF-PO and CONUS level supply depots. Follow-on considerations such as space available on a post and cost of new structures should be included in decisions on which units to sea-base. Cost avoidance of building or renovating buildings from the logistics forces

must be included in the cost of seabasing to determine an accurate picture of the savings versus land basing.

APPENDIX

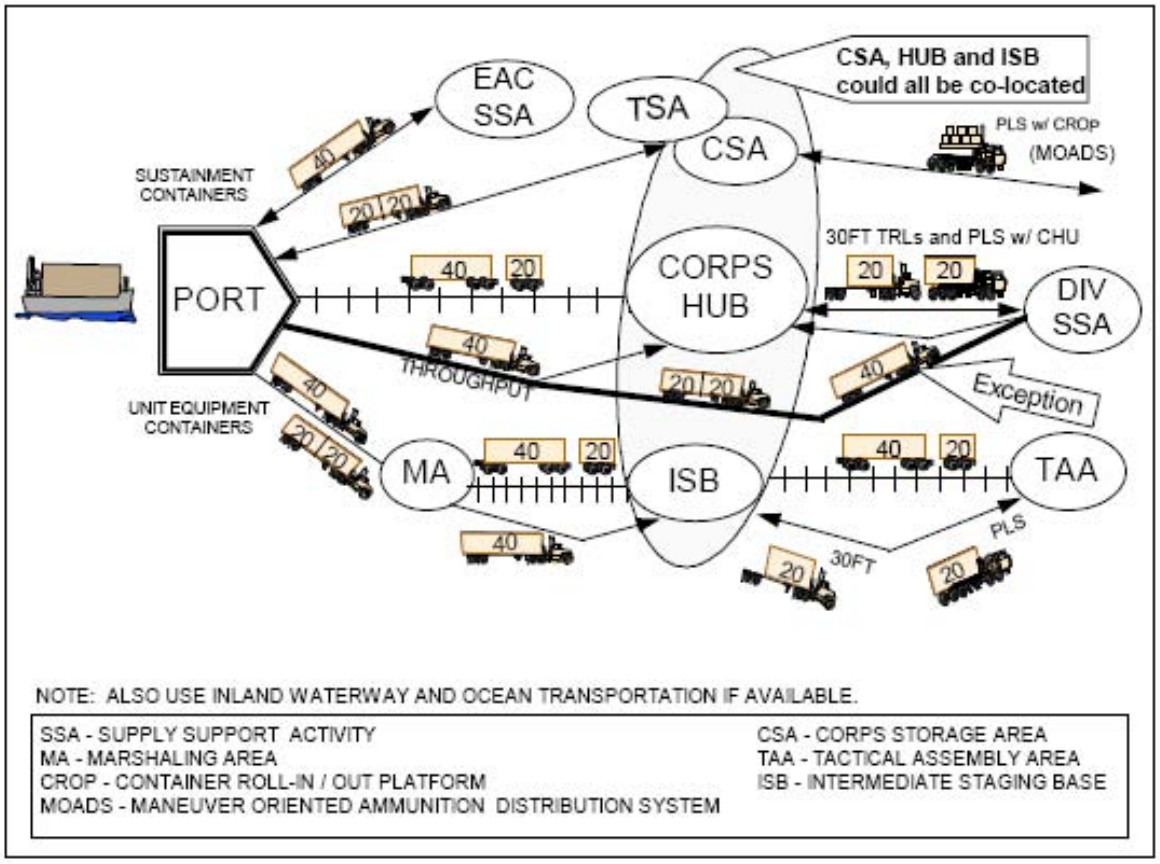

Figure 1 Inland Movement FM 55-80 p 2-1

ROLE OF JTF-PO IN AIRFIELD OPENING

1. Overview

a. Contingency support for a combatant commander may require establishing a rapid port opening capability and the placement of an initial deployment and distribution node in the theater of operations. If such a capability is required, the combatant commander may request that a JTF-PO unit be employed to the APOD. This unit is a USTRANSCOM attached entity whose mission is to provide a joint expeditionary capability to rapidly establish and initially operate a port of debarkation and distribution node, facilitating the port throughput within a theater of operations.

b. The JTF-PO is designed to combine specific Air Force and Army capabilities to provide the commander USTRANSCOM with a ready-to-deploy, jointly trained force for opening ports and establishing the initial distribution network. The JTF-PO facilitates joint reception, staging, onward movement and integration (JRSOI) (JP 401.8) and theater distribution (JP 4-01.4) by providing an effective interface at the APOD and distribution node. (The May 2008 JP 4-09 revision will consolidate both JP 4-01.4 and JP 4-01.8). The JTF-PO functions are as follows:

(1) APOD assessment.

(2) Distribution network assessment.

(3) APOD opening and initial operation.

(4) Distribution node management.

(5) Cargo and passenger operations.

(6) Movement control including coordinating for onward movement of arriving cargo and passengers.

(7) Establishment of joint in-transit visibility (ITV) and radio frequency identification (RFID) network.

c. A key feature of the JTF-PO along with opening an APOD is to open and initially operate an associated forward distribution node (e.g., cargo marshalling or transload location if required) within 10 kilometers of the airfield ramp area.

d. In order to preclude the build-up of cargo at the APOD, the JTF-PO may be employed to provide early theater facilitation and capability to move the cargo off the ramp at the airfield to the forward node for eventual distribution into the theater. If this capability is desired for cargo movement off the airfield, the following planning considerations may assist in planning and execution of this mission.

Table I-3. Notional Army Brigade Augmentation Requirements			
Type Operations		From USMC	From Army
C2	Liaison	X	X
	Communications	X	X
	Military police		X
	Civil affairs	X	X
Intelligence	Long range reconnaissance and surveillance	X	X
	Intelligence and electronic warfare	X	X
	Communications	X	X
Maneuver	Combat forces	X	X
Fire Support	MLRS		X
	EW	X	X
	Target acquisition	X	X
	Naval gunfire spotters	X	
Mobility/Survivability	Combat engineers	X	X
	Bridging		X
	Chemical		X
Aviation	Air support (fixed wing)	X	
	Air support (rotary wing)	X	X
	Maneuver (rotary wing)	X	X
Air Defense	SHORAD/HIMAD	X	X
	C2	X	X
Logistics	Class III operations		X
	Class IV operations	X	
	Class V operations		X
	Medical support	(USN)	X
	Transportation		X
	Personnel		X
	Terminal operations	X	X
	Maintenance		X
	Class IX operations (limited)		X
Mortuary Affairs			X
Psychological Operations			X

Legend:
MLRS – multiple launch rocket system
SHORAD – short range air defense
HIMAD – high to medium altitude air defense
USN – United States Navy

Figure 3 Notional Army Brigade Augmentation Requirements FM 3-31 p I-9

Table I-4. MEB Augmentation Requirements			
Type Operations		From USMC	From Army
C2	Liaison	X	X
	Communications	X	X
	Military police	X	
	Civil affairs	X	X
Intelligence	Long range reconnaissance and surveillance	X	X
	Intelligence and electronic warfare	X	X
	Communications	X	X
Maneuver	Combat forces	X	X
Fire Support	MLRS		X
	EW	X	X
	Target acquisition	X	X
	Naval gunfire spotters	X	
Mobility/Survivability	Combat engineers	X	X
	Bridging (from reserves)	X	X
	Chemical		X
Aviation	Air support (fixed wing)	X	
	Air support (rotary wing)	X	X
	Maneuver (rotary wing)	X	X
Air Defense	SHORAD/HIMAD		X
	C2		X
Logistics	Class III operations		X
	Class V operations		X
	Medical support	(USN)	X
	Transportation		X
	Personnel	X	
	Terminal operations	X	X
	Maintenance		X
Mortuary Affairs			X
Psychological Operations			X

Figure 4 Marine Expeditionary Brigade Augmentation Requirements FM 3-31 p I-10

Table IX-8. Combat Service Support Organizations				
Unit	Service	Commanded by:	Approximate Personnel Strength	Habitual Unit Supported
Corps Support Command	US Army	MG	10,000 to 14,000	Corps
Force Combat Service Support Group (FSSG)	USMC	BGen	8,000 to 10,000	MEF
Division Support Command	US Army	COL	2,000 to 3,000	Division
Brigade (Combat) Service Support Group (BSSG (CSSG))	USMC	Col	1,000 to 2,500	MEB (RLT & MAG)
Main Support Battalion (MSB)	US Army	LTC	1,000	Bde
MEU Service Support Group (MSSG)	USMC	LtCol	250 to 340	MEU (SOC)
Forward Support Battalion (FSB)	US Army	LTC	200 to 270	Bde
Combat Service Support Detachment (CSSD)/ Mobile (MCSSD)	USMC	LtCol-Capt	100 to 800	Regt, BLT, or squadron

Figure 5 Pre-2005 Combat Service Support Organizations FM 3-31 p IX-15

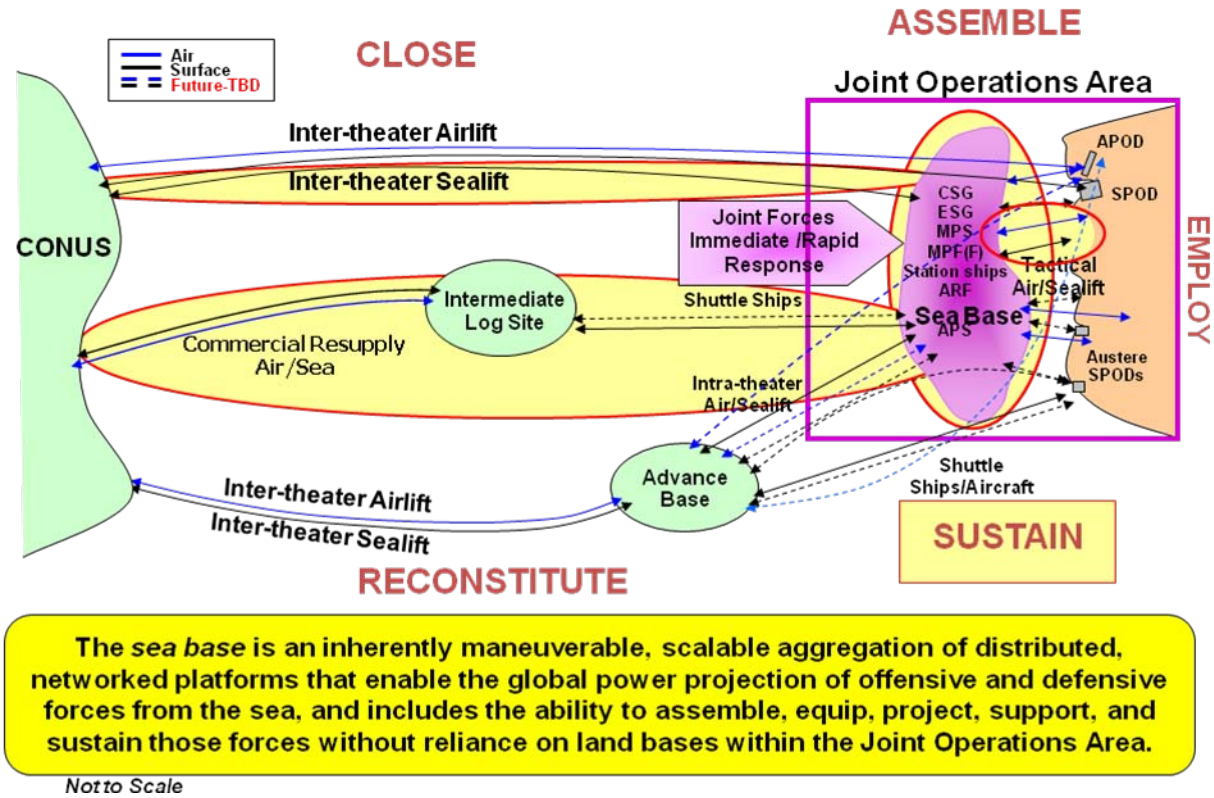

Figure 6 Sea-base Overview NDIA Expeditionary Warfare Conference RADM Charlie

Hamilton Presented 20 October 08

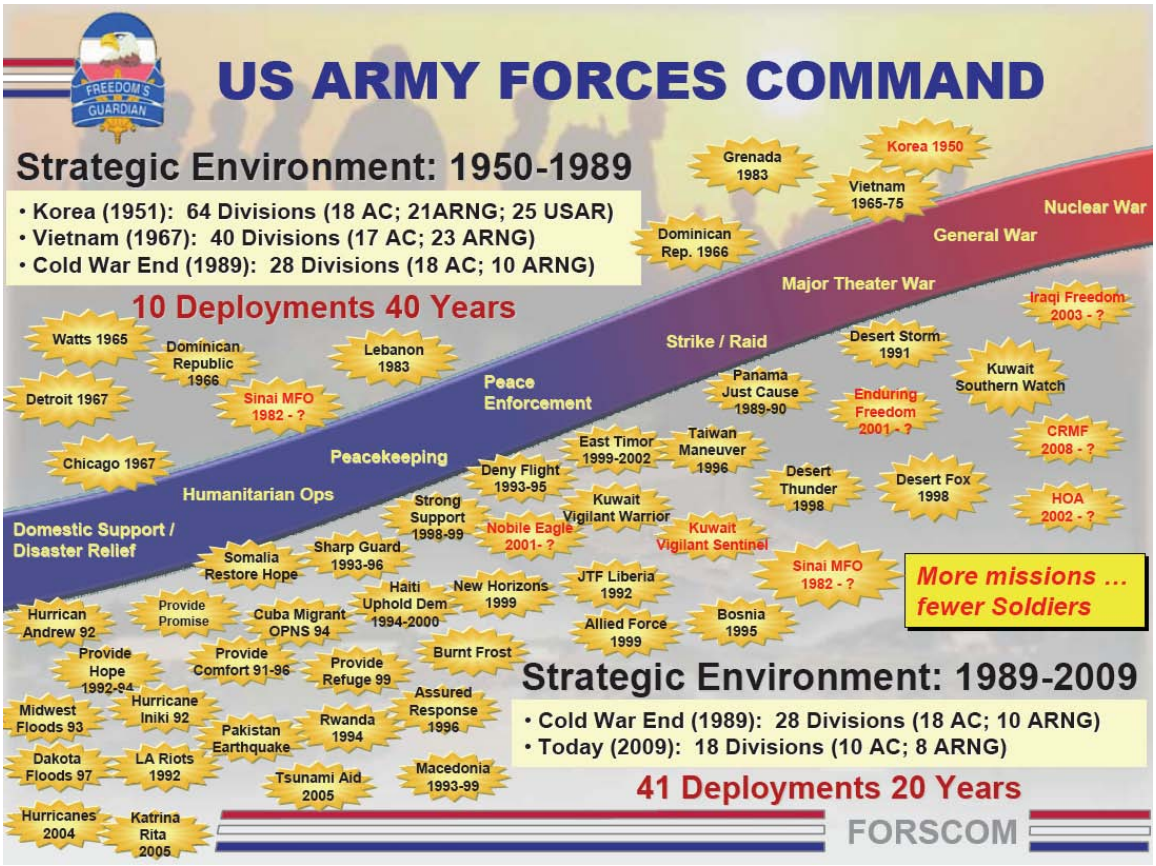

Figure 7 Comparison of Deployments 1950-1989 to 1989-2009 FORSCOM DTIC

Presented 20 October 08

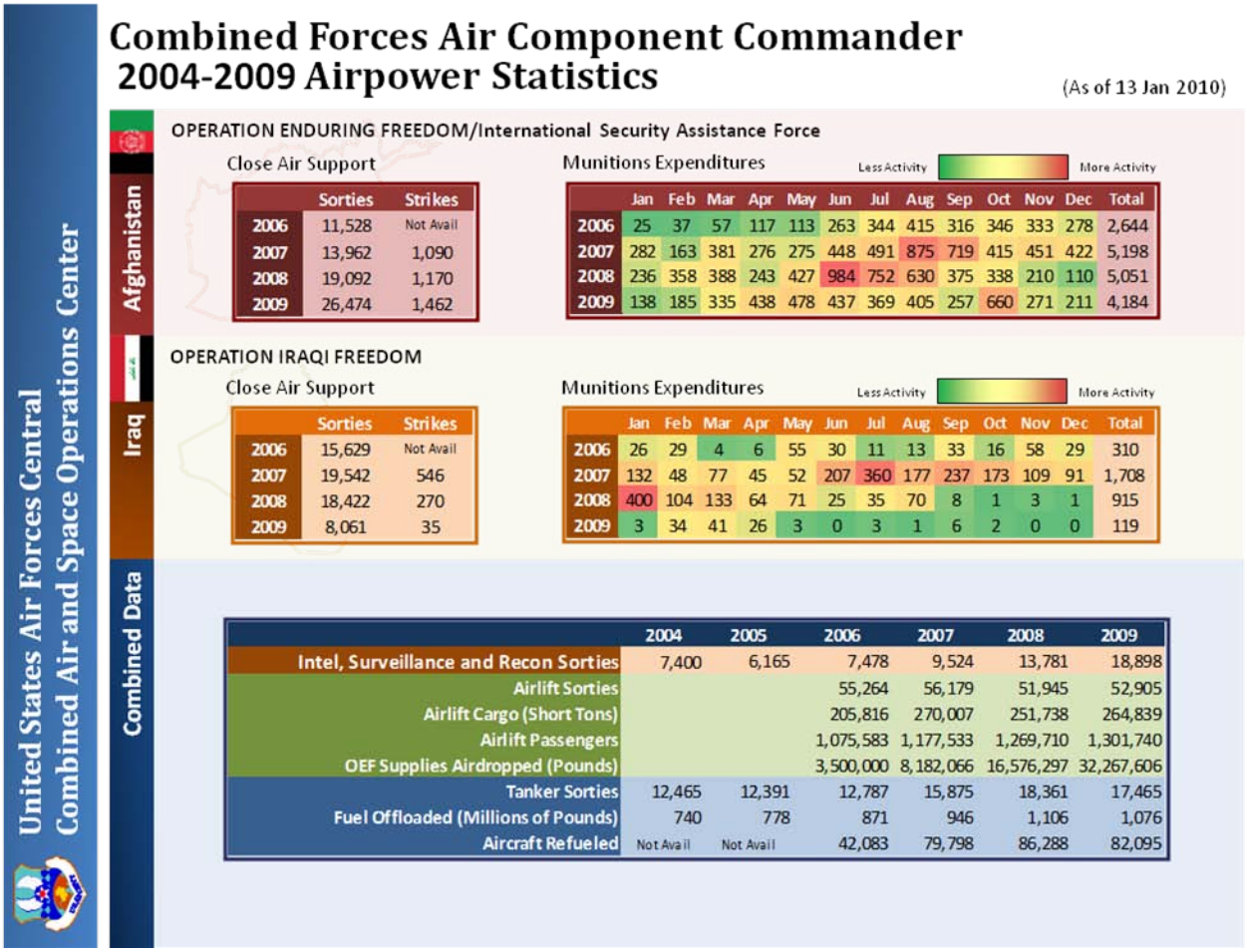

Figure 8 CFACC 2004-2009 Airpower Statistics As of 13 January 2010

B.4 POWER LINE SURGE PROTECTION FOR MOBILE ELECTRICAL EQUIPMENT. Any single-phase 115-volt mobile-transportable equipment which is permanently located and is energized more than 50 percent of the time (such as copiers, personal computers and peripherals and soda machines) shall not be connected to the ship's existing isolated receptacle circuits to prevent electrical overload resulting in a fire hazard.

B.4.1 Separate single-phase circuit. Each piece of equipment of this type should be connected to a separate single-phase circuit through an isolation transformer supplied by the lighting distribution system, using a multi-outlet power line strip (surge suppressor) in accordance with NSTM Chapter 300 when appropriate.

a. Where a multi-outlet power line strip is required, only one is allowed on one isolated receptacle circuit and the total equipment load must not exceed 13 amperes.

b. Since most commercial personnel computers and peripherals and similar equipment generally do not disconnect both power lines when the power switch is in the "off" position, each of these mobile equipments should be unplugged from the power receptacle when switched off.

B.4.2 Power line strip surge suppressor for marine use. A marine type surge suppressor has a metal case, a double-pole switch/circuit breaker, multiple plugin receptacles, and dual thermal fuses to prevent overheating in accordance with commercial item description (CID) A-A-50622. When all computer and peripheral equipments at a single work station are energized by power supplied through the "on/off" switch of a electrical surge suppressor, it will not be necessary to unplug each equipment from the power line receptacles or unplug the power line strip from the isolated receptacle circuit.

GLOSSARY

AFSB--Afloat Forward Staging Base

AOR--Area of Responsibility

APS--Army Prepositioned Stocks

BCT--Brigade Combat Teams

DLA--Defense Logistics Agency

FSS--Fast Sealift Ships

HMMWV--High Mobility Multipurpose Wheeled Vehicle

ISO--International Organization for Standards

JFC--Joint Force Command

JHL--Joint Heavy Lift

JHSS--Joint High Speed Sealift

JHSV--Joint High Speed Vessel

JIC--Joint Integrating Concept

JMAC--Joint Maritime Assault Connector

JOA--Joint Operations Area

LCAC--Landing Craft, Air Cushioned

LMSR--Large, Medium-Speed, Roll-On/Roll-Off Ships

MFTS--Maneuver from The Sea

MCO--Major Combat Operations

MRAP--Mine Resistant, Ambush Protected

MSC--Military Sealift Command

PLS--Palletized Loading System

PREPO--Prepositioned Equipment

RSO&I--Reception, Staging, Onward Movement, and Integration

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