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Joint Theater Logistics: Maritime Support

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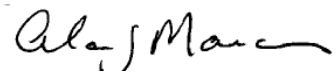

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Executive Summary

The Director, Supply, Ordnance, and Logistics Operations Division (N41) requested that the Center for Naval Analyses (CNA) examine the feasibility of better integration of current Navy logistics practices and organizational structure into joint theater logistics (JTL). We explored the evolving maritime element of JTL and the Navy's role in supporting it. We found that new joint logistics doctrine is being rapidly developed as part of the overall DOD transformation effort and that each military Service has a different approach to accomplishing focused logistics.

We discovered that Navy maritime JTL issues lie in several areas. Title 10 U.S. Code provides logistics authority to both Services and the Combatant Commanders (COCOMs) which results in a concern of possible overlap of responsibility and duplication of efforts. Under the standard joint organizational structure, maritime JTL support is included under the surface operations branch and is doctrinally treated the same as land-based logistics. Peacetime and warfighting structures are different which could result in confusion and communication breakdowns during future contingencies. In addition, there currently is little maritime common user tactical lift capability to support JTL. Finally, current maritime logistical support plans assume a benign operating environment, which may not be realistic in tomorrow's world situation.

We determined that the COCOMs desire to see/sense real-time logistics across their entire theater of operation. They want to respond to warfighter needs by directing logistics flow through control of common user logistics lift. Finally, the COCOMs want to be able to collaborate with other nations, agencies, other COCOMs, and Service components to maximize their JTL capability.

It appears, not surprisingly, that each military Service has approached JTL with a focus of fixing the most critical problems in their current

logistics practices. The Army's Distribution Management tries to speed up distribution in the supply channels and reduce the size of their intermediate staging bases. Their key focus is the last tactical mile and their most critical problem is force protection of land based logistics channels. They are also dealing with the throughput limitations of strategic and tactical airlift as they work to become more expeditionary and agile in their troop deployment.

The Air Force's Expeditionary Agile Combat Support program concentrates on the ability to add foreign airfields as Forward Operating Locations (FOLs) to their node-to-node logistics distribution system. They are limited by host nation agreements and the relatively small transport capacity of their airlift cargo aircraft. They also face the risk that infrastructure capital investments may be lost on a moment's notice if the host country decides to exercise their sovereignty and evict them from the operating location. It is also difficult and time-consuming to convert a bare airfield into an Air Force FOL. Their focus is to push the strategic airlift as far into the theater as possible to reduce handling and lighten the requirements for tactical airlift.

The Marine Corps has embraced Precision Logistics which is task-organized and tailored to their expeditionary operational basis. They have focused on rapid introduction of logistics over-the-shore from pre-positioning maritime assets as well as combat logistics force vessels. The Marine Corps has pioneered the concept of a sea base for force projection and their experience is shaping much of the current sea base concept development. However, the Marine Corps and the Navy who supports them, have difficulty in building logistics supply channels more than 50 to 100 miles inland and maintaining support for more than 60 days. By current doctrine, the Marine Corps in a joint environment is to rely on the Army logistics support system after the initial 60 days of operation. However, they then experience the same issues and difficulties that Army units encounter.

Navy logistics doctrine currently supports a High Yield Logistics Support process which is centered on reducing the need for spare parts. The logistics system is described as having a hub-and-spoke structure. The Navy's deployment operational concept; large, organic logistics capacity; capability to produce potable water on station; and accom-

panying combat logistics ships with underway replenishment, make the fleet units very independent, mobile, and able to stay on station for long periods of time. This ability to basically pack up all the supplies needed prior to months-long deployments has shaped the Navy's logistics support system and made it very different from the other Services. The Navy focuses on logistics support for spare parts and replacement equipment for unanticipated broken or damaged items. Other than some assistance with transport of spare parts and the rare movement of materiel between ALSS and RLS locations, the Navy normally needs little in terms of joint support from the other Services for fleet units.

We looked at inherent maritime logistics strengths which could possibly be leveraged to better support the other Services' logistics needs. We found that probably the greatest maritime advantage is that of mobility and retention of sovereignty. Along with this mobility and freedom of maneuver, maritime logistics assets have the range and independence to span the globe and remain on station for months at a time, if necessary, without extensive external support. The next greatest strength is the large volume of materiel that maritime vessels can transport. The large surface area of the oceans, along with the constant force movement and ability to maintain large stand-off distances from potential enemies, provide an inherent force protection for maritime assets. The Navy has developed a robust theater missile defense capability which can be extended to cover portions of the shoreline. Maritime vessels can produce their own potable water and can have large quantities of refrigerated storage space. One additional maritime strength is that the nature of fleet operations dictates that peacetime logistics support is performed the same, in terms of relative tempo and procedures, as in wartime. (The one exception could be the resupply of ammunition to the combat logistics force in the unlikely event that the pace of battle causes the fleet to exhaust its stock of munitions.) Finally, the Navy's hub-and-spoke logistics system was built around resupply of perishables and spare parts anywhere in the world, which has resulted in a global distribution of numerous regional contracting and procurement offices.

Capitalizing on these maritime strengths could result in significant logistics support for the joint forces. In our review of recent humani-

tarian assistance operations and a case study of Pacific Command and Pacific Fleet relationships, we found small steps which could enhance joint logistics support through improving coordination among staffs; expanding role of regional contracting offices to support other Services; producing additional potable water for shore use; and partnering to improve logistics command and control by standardizing logistics tracking, labeling, and packaging systems. However, in order to significantly increase joint logistics support, the Navy would need to invest in common use tactical logistics sealift (such as high-speed diesel-powered, water jet catamaran vessels) and acquire amphibious seaplanes that could bridge the gap from the sea base to points over 1,000 miles inland. In addition, only the Navy can provide maritime force protection, and although current warfighting ships are very capable, there may not be enough of them to cover the territory if our current benign maritime logistics operating environment changes. Armed, fleet-configured high-speed vessels with helicopter decks could provide excellent maritime logistics force protection, riverine squadron support, JTF embarked staff support, humanitarian assistance support, and maritime logistics choke point patrol capabilities to the joint environment.

All of the above possible actions will help improve each of the JTL concern areas that were identified. However, we consider them as options rather than recommendations since the Navy does not currently have significant logistics shortfalls within its own operations. The degree that the Navy seeks to assume a greater role within JTL support is a value proposition which should be evaluated against other future expenditures in terms of capability gain for each dollar spent. In addition, the joint forces need to define and validate the need for these new capabilities. However, each of these support concepts would add significant capability to maritime joint theater logistics operations.

Introduction

This paper explores the evolving maritime element of joint theater logistics (JTL)[1] and the Navy's role in supporting it. Recent operations such as Iraqi Freedom (OIF) and Enduring Freedom (OEF) have revealed multiple challenges with JTL. New joint logistics doctrine is being rapidly developed as part of the overall Department of Defense (DOD) transformation effort. The Navy needs to fully understand these upcoming changes and new joint logistics needs in order to best support the maritime portion of JTL.

Background

The DOD is transforming its logistics capabilities to dramatically improve future joint force operations. A central objective of the 2001 Quadrennial Defense Review (QDR) was to shift the basis for defense planning from the current threat-based model to a capabilities-based model for the future [1]. The 2001 QDR went further in establishing a foundation for logistics changes by stating the case for change, providing specific areas to change, and identifying the conditions and

1. Joint theater logistics (JTL) is defined in this report as: The capability for the joint force commander to apply logistics resources to generate and sustain force employment that spans the range of military operations throughout an assigned theater of joint operations area. JTL includes organization, authorities, and processes over assigned and attached forces to achieve desired joint and combined effects and operational objectives. It involves the management of a collective and synchronized set of activities, operations, organizations, and tools which enable the application of joint logistics capabilities from strategic resource partners to tactical commanders (to include contractors, logistics civil augmentation, exploitation of captured materiel, and support capabilities) in support of two or more military department components. (Source: JTL Council of Colonels, approved by General Officer Steering Committee on 26 July 2005)

constraints under which change must be accomplished. The Secretary of Defense (SECDEF) provided additional guidance for the logistics and supply chain management process by directing the Under Secretary of Defense for Acquisition, Technology, and Logistics to be designated as the Defense Logistics Executive (DLE) [2]. The DLE was given the authority to integrate the global supply chain and be advised by a Defense Logistics Board (DLB) similar to the way the defense acquisition executive is advised by the Defense Acquisition Board. In addition, the Commander, U.S. Transportation Command was designated as the Distribution Process Owner (DPO).

Most geographic Combatant Commanders (COCOMs) have established Joint Deployment and Distribution Operations Centers (JDDOCs) to coordinate joint theater logistics within their areas of responsibility. Although the JDDOC organizational structures are not identical, most have separate air and surface branches. The maritime element is one of the two components of the surface branch, the other being land transportation [3]. Office of the Chief of Naval Operations (OPNAV) N41 is the Navy sponsor for developing the maritime component of the JTL framework.

The Center for Naval Analyses (CNA) has been asked to examine the feasibility of integrating current Navy logistics practices and organizational structures into the JTL structure. The study identifies theater-level unique and common needs of COCOMs and Services, both now and for the future. We also identify short-term joint maritime support possibilities and desired future joint logistics capabilities.

Issues

With the rapid development of joint theater logistics doctrine and the evolving JDDOC organizational structure, there are numerous issues and concerns that arise with implementation of maritime JTL support. We grouped them into the following major categories:

- **Service responsibility** - Title 10 U.S. Code[2] provides the military departments with the authority to train, supply, and equip their respective forces. However, with the COCOM staffs setting priorities, redirecting, and controlling assets within their areas of operations, the possibilities for inefficiencies and duplicated effort abound.

- **COCOM responsibility** - Title 10 U.S. Code[3] also provides the COCOMs authority to set priorities, redirect, and control logistics assets within their areas of operations. However, they cannot direct the use of Service money for training, supplies, and equipping of the forces. This is similar to the concern raised under Service responsibilities, in that it adds to the potential possibility for logistics inefficiencies and duplicated effort.

- **Joint deployment and distribution operations centers** - Maritime JTL support is currently rolled up under the surface operations branch of the JDDOC and is doctrinally treated the same as land-based logistics. Given that maritime logistics support can be very different (i.e., maritime force protection) from land-based operations, and that current theater logistics operations are dominated by land logistics thinking, future operations that require additional maritime support may find the staff lacking in sufficient maritime support experience.

- **Peacetime and warfighting structure mismatch** - The current N4 fleet logistics support personnel are not in most cases in the same organizational structure that they would be in to support the COCOM J4 organization in the event of a contingency operation. This could result in confusion and a breakdown in communication at a most critical point in execution.

- **Maritime common user intratheater lift capability** - There currently is no maritime common user intratheater lift capability (outside of some part-time experimentation with four leased

2. United States Code - Title 10, Subtitle C, Part I, Chapter 503, Section 5013 for Secretary of the Navy

3. United States Code - Title 10, Subtitle A, Part I, Chapter 6, Section 164

high speed vessels[4]). Although there has not been significant demand for maritime common user tactical lift due to the nature of Central Command (CENTCOM) operations, the capacity is currently limited to a few deep draft Military Sealift Command (MSC) operated logistics support vessels.

- **Maritime logistics asset force protection** - Current maritime logistical support plans assume a benign operating environment, which in today's world situation is not unrealistic. However, future conflicts with adversaries of some ocean-spanning access denial capability could cause a significant disruption of maritime supply lines.

Although these issues are not the only logistics problems facing the Services and COCOMs, they are the major ones facing maritime JTL. Next we identified our study goals for investigating this subject.

Study Goals

Our goals for this study are to identify the current joint force needs for JTL, determine other Service's approaches to meet these requirements, identify inherent Navy maritime logistics strengths, and generate current and future possibilities for improvement of maritime JTL support. Achieving these goals can be broken down into the following major steps:

- **Identify joint theater logistics requirements** - Requirements for JTL are generated by the COCOMs from guidance received in the Doctrine for Logistic Support of Joint Operations [5]. We identified what the current requirements are for JTL support.
- **Analyze other Service approaches** - The Army, Air Force, and Marine Corps each approach JTL support from their own

4. The Theater Support Vessel advanced concept technology demonstration project was approved in September 2002. As of 2004, four vessels were under lease by the Army, Navy, and Marine Corps in support of experimentation: the HSV-2 *Swift* (USN/USMC), TSV-1X *Spearhead* (US Army), HSV-X1 *Joint Venture* (USN), and MV *WestPac Express* (USMC) [4].

historical experience and operational environments. We examined each Service's logistics doctrine, organizational structures, and current policies in order to identify the differences and similarities in their approaches to JTL support.

- **Identify inherent Navy maritime logistics strengths** - We looked at current Navy logistics operations to identify the basic and fundamental strengths that could be applied to JTL.
- **Analyze recent tsunami humanitarian assistance maritime support** - Operation: Unified Assistance provided the military support to the U.S. relief efforts organized in response to the 26 December 2004 earthquake and tsunami in the Indian Ocean. This was mostly a maritime-based humanitarian assistance operation. We looked at the after-action reports to determine if there are any lessons to be learned for application to JTL.
- **Separate Navy unique logistics requirements from common user support capability** - We looked at the Navy's total maritime logistics support capability and divide the assets into those required for internal fleet operations and those available for common use.
- **Analyze PACOM JTL organization as case study** - Since the Pacific Command (PACOM) area of responsibility (AOR) includes the largest maritime environment of all the COCOMs, we investigated its current JTL structure as an overarching case study.
- **Identify current joint support opportunities** - We generated possible policy and organizational changes which could be used to improve the current execution of maritime JTL and help with the previously identified issues.
- **Identify future possibilities** - We also generated possible future capital investments which could, in the long-term, add additional capability to the Navy's maritime JTL support and help with the previously identified issues.

We will first look at the basis for the DOD logistics transformation and the organizations and current policies and doctrine that are driving the changes which are influencing development of JTL.

DOD logistics transformation

Focused logistics

The Department of Defense is continuously revising military doctrine and policy to reflect the current state of world affairs and state-of-the-art technology. Joint Vision 2010 [6], a DOD policy report, outlines and discusses how the four Service branches might conduct future joint operations. That document identified four operational concepts that form the backbone from joint warfighting efforts. The four concepts discussed were: 1) Dominant Maneuver, 2) Precision Engagement, 3) Focused Logistics, and 4) Full-Dimensional Protection. We now discuss the concept of focused logistics and the role it plays in joint theater logistics operations.

As was observed in Operation Iraqi Freedom, the speed at which men and materiel can be repositioned in the theater of battle is and will be the key factor in conflicts [7]. The days of massive buildups of men and warfighting materiel that took place prior to D-Day in World War II and even in the first Iraq war, are long over. Focused logistics prescribes that in order to optimize the concept of dominant maneuver, precision engagement, and full dimensional protection, the logistics effort must be responsive, flexible, and precise.[5] The key to focused logistics is to rapidly meld information sources, logistics efforts, and technologies to yield a rapid response to conflicts and military actions. The concept calls for a dynamic logistics approach where assets can be immediately shifted from one location to another. In addition, logistics functions will be tailored to the specific level of operations. This includes strategic, operational, and tactical levels of

5. In *Joint Vision 2010*, the term "optimize" was used without reference to a specific objective function. To speak of optimizing a system or optimization in general has little relevance unless a precise definition of an objective function and the associated system constraints are present.

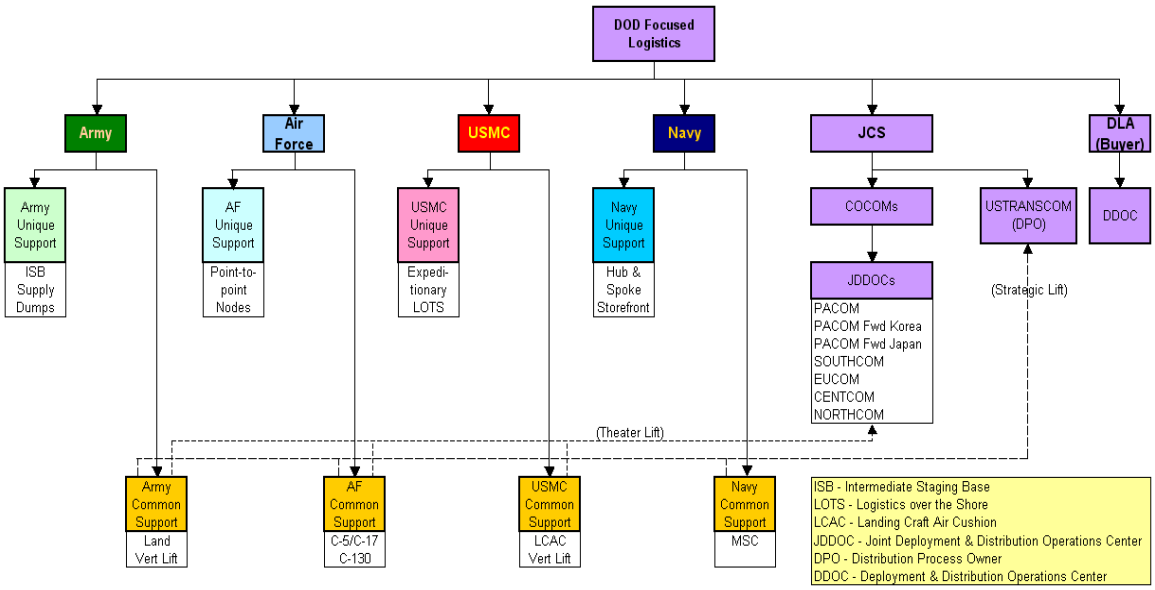
operations. This approach to logistics will require considerable contingency planning on the part of experienced logisticians. To achieve this model of tailored logistics, planners must develop a concept of logistics operation for each possible area where the U.S. might be involved in significant military operations. There is no generic logistics[6] model that will be applicable to each operational scenario. Recall that *Joint Vision 2010* spotlights the notion of all Service branches working in harmony in theater. Thus, for each contingency there must be a pre-existing structured logistics model on which to base the initial logistic operational construct. The core concept of *Joint Vision 2010* is to develop greater capability with a smaller deployed force and to achieve this by developing a streamlined and synergistic set of plans based on the four operational concepts previously set forth. In essence, the concept of focused logistics seeks to

6. We used this definition of logistics for this study. "The science of logistics concerns the integration of strategic, operational, and tactical sustainment efforts within the theater, while scheduling the mobilization and deployment of units, personnel, equipment, and su[pplies in support of the employment concept of a geographic Combatant Commander. The relative combat power that military forces can bring to bear against an enemy is constrained by a nation's capability to plan for, gain access to, and deliver forces and materiel to the required points of application across the range of military operations. Supply is the function of acquiring, managing, receiving, storing, and issuing the materiel required by forces. Maintenance includes actions taken to keep materiel in a serviceable condition or to upgrade its capability. Transportation is the movement of units, personnel, equipment, and supplies from the point of origin to the final destination. Civil engineering provides the construction, operation, maintenance, damage repair, and reconstitution of facilities, roads, and utilities and logistic infrastructure. Health services include medical evacuation, hospitalization, medical logistics, medical laboratory services, blood management, vector control, preventative medicine services, veterinary services, and dental services. Other services are nonmaterial support activities provided by Service personnel and the logistic community that are essential to force support. For each of the above functional areas, the Combatant Commander should consider these four elements of the joint theater logistic process: procurement and contracting, distribution, sustainment, and disposition and disposal [5]."

identify the unifying, minimal logistics footprint required to achieve the defined military goal.

In summary, focused logistics has a similar goal to that of all logistics processes—to provide the joint force the right personnel, supplies, and equipment at the right place, in the needed quantities, and at the right time across the entire spectrum of military operations. However, each Service implements the logistics functional areas differently, which generates very different approaches, training, and organizational structures. Figure 1 provides an simplified overview of these relationships within the DOD focused logistics concept.

Figure 1. Department of Defense logistics relationships



JCS logistics doctrine

The logistics doctrine put forth by the Joint Chiefs of Staff (JCS) is well documented in [5], [8], and [9]. This section summarizes the key points of these documents.

The word "doctrine" means, here, the fundamental principles by which the military forces guide their actions in support of objectives. The doctrine is authoritative but requires judgement in application.[7] In the literature, we found much in the way of general logistics doctrine. A large set of principles governs the general concept of joint logistics but none address any logistics issues in specific detail. The implementing details of actual logistics operations are the responsibility of sub-commanders and trained logisticians. In essence, the doctrine describes what is expected of the logistics process but does not prescribe exactly how to develop the specifics of the joint logistics system.

The joint logistics doctrine begins by defining "logistics" as,

> the process of planning and executing the projection, movement and sustainment, reconstitution, and redeployment of operating forces in the executing of national security policy.[8]

Note that the definition given in joint doctrine defines logistics as a process. A process, by definition, is a prescribed set of actions that achieves some end result. Whereas focused logistics guidance addresses the desired result, joint doctrine refers to logistics as a process without defining the desired outcome.

Distribution process owner

In September 2003, U.S. Transportation Command (USTRANSCOM) was designated as the Distribution Process Owner (DPO) for the joint logistics initiative [2]. Upon receiving this designation, USTRANSCOM began a series of initiatives to consolidate and enhance the way the DOD logistically supports the warfighter. USTRANSCOM is supported by the transportation assets of the Navy's Military Sealift Command (MSC), the Air Force's Air Mobility

7. This definition is taken from the North Atlantic Treaty Organization (NATO) Logistics Handbook.

8. Joint Publication 4-0, Doctrine for Logistic Support of Joint Operations (page v)

Command (AMC), and the Army's Surface Deployment and Distribution Command (SDDC). Hence, USTRANSCOM, located at Scott Air Force Base near Bellville, Illinois, is the single combatant commander for the transportation components contained within each of the three Services, respectively. USTRANSCOM was redesignated as the DOD's DPO in May 2006 [10]. This restatement was released in order to strengthen the teamwork and to increase the momentum of change in transforming distribution related processes.

Initially, USTRANSCOM began several initiatives that were considered critical to a successful distribution logistics effort [11]. These included:

- Distribution and deployment processes
- Billing, funding, and budget processes
- End-to-end distribution architecture
- Direct vendor delivery processes
- Radio frequency identification
- Supply and transportation priority system
- Time definite delivery processes.

The common theme for any logistics system is to have the correct amount of materiel shipped to the correct location at the correct time. All of the above initiatives are being pursued because they are all critical to meeting the overall goal of the joint logistics system. Some were identified because they would also help correct shortcomings in the current logistics distribution process. However, all military distribution systems face unique problems when attempting to deliver the necessary supplies to the last tactical mile.

At this point we would like to briefly discuss a few basic differences between military logistics distribution systems and those encountered in commercial operations. In recent years, commercial logistics operations with the continental United States have received favorable press coverage describing how efficient they have become. In many instances plants that assemble large items, such as automobiles and other large appliances, have moved towards a just-in-time delivery

system from their supply vendors. Each day, vendors deliver to these plants the right amount of parts need to cover the assembly requirements for that day. The advantage is that the assembly plant does not have to build additional warehousing, maintain inventory stocking levels, or worry as much about stock losses. Plus they do not have to tie up as much capital to maintain supply inventories. These systems work well provided everything arrives on time. However, problems with the delivery system on any given day will impact the entire operation for several days. These distribution systems are also geared towards operations where the exact same quantities of parts are needed, with certainty, day after day. In military distribution logistics, it is never known with certainty what is going to be needed 10 days hence, or exactly where it will be needed. So, the military logistics system must be far more adaptable to the changing needs of the combat theater of operations. For this very reason, although the distribution process owner can strive to achieve targeted values for performance metrics, commercial logistics procedures and optimization models related to static commercial operations have limited applicability in joint military logistics operations.

Consolidated buyer

On 1October 1961, the Defense Supply Agency (DSA) was established by then Secretary of Defense, Robert McNamara, as a separate common supply and Service defense agency for the DOD. Subsequently, defense officials changed the name of the DSA to the Defense Logistics Agency (DLA) on 1 January 1977 to recognize the growth and greatly expanded responsibilities for the organization. On 1 October 1986, the Goldwater-Nichols Reorganization Act identified the DLA as a combat support agency and required that the selection of the DLA Director be approved by the Chairman of the Joint Chiefs of Staff. In April 1990, the Secretary of Defense directed that all the distribution depots of the military Services and DLA be consolidated into a single, unified materiel distribution system to reduce overhead and costs, and designated DLA to manage it. Since 1961, the agency has successfully standardized, procured, managed, and distributed DOD consumable items throughout the military Services and has assumed a major logistics role previously performed

by each of the military Services. DLA has been assigned as the executive agent for Class I (subsistence), Class III (fuel), and Class VIII (medical) supplies for future theater operations [12]. DLA has established fixed forward depots in Germany, Guam, Italy, Japan, Korea, Kuwait, and Sicily. These depots solve many of the in-theater sustainment issues and significantly reduce the average customer wait time.

DLA has strengthened its role as the consolidated buyer for DOD by assisting with the establishment of Deployment and Distribution Operations Centers (DDOCs). As part of the DDOC, various DLA subject matter experts in distribution and commodities work with in-theater logistics personnel to improve in-transit visibility of DLA stocks, enhance DLA theater presence, and reduce customer wait time.

JDDOCs

Joint Deployment and Distribution Operations Centers (JDDOCs) have been established in PACOM, PACOM forward Korea, PACOM forward Japan, CENTCOM, SOUTHCOM, EUCOM, and NORTHCOM. The JDDOC[9] is an integrated operations and fusion center, acting in consonance with the geographic combatant commander's overall requirements and priorities, and on behalf of the combatant commander, that directs common user and intratheater distribution operations. Its ultimate goal is to maximize the geographic combatant command's operational effectiveness through integrated support to joint force projection, improved end-to-end distribution, and asset visibility. A JDDOC is normally placed under the direction of the combatant commander's Director for Logistics (J4), but may be placed under other command or staff organizations. The Joint Warfighting Center Joint Doctrine Series Pamphlet 8 [3] provides concepts and doctrinal implications for a generic theater operations center.

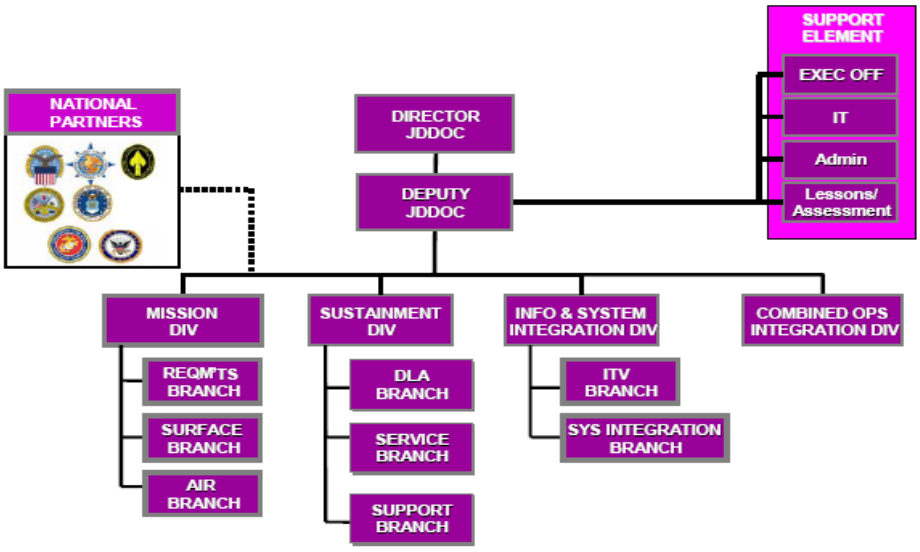
9. The JDDOC mission is to support the geographic combatant commander's operational objectives by synchronizing and optimizing he intertheater and intratheater distribution aspects of deployment and multi-modal transfer resources to integrate the proper mix of flow of forces, materiel, and other forms of sustainment in support of the geographic combatant commander missions.

The generic JDDOC organizational structure consists of a Director Group, Support Element, and four divisions:

- Mission Division
- Sustainment Division
- Information and Systems Integration Division
- Combined Operations Integration Division

Figure 2 shows a typical organizational chart. This structure can be tailored to meet the geographic combatant commander's needs and situational requirements.

Figure 2. JDDOC generic organization structure



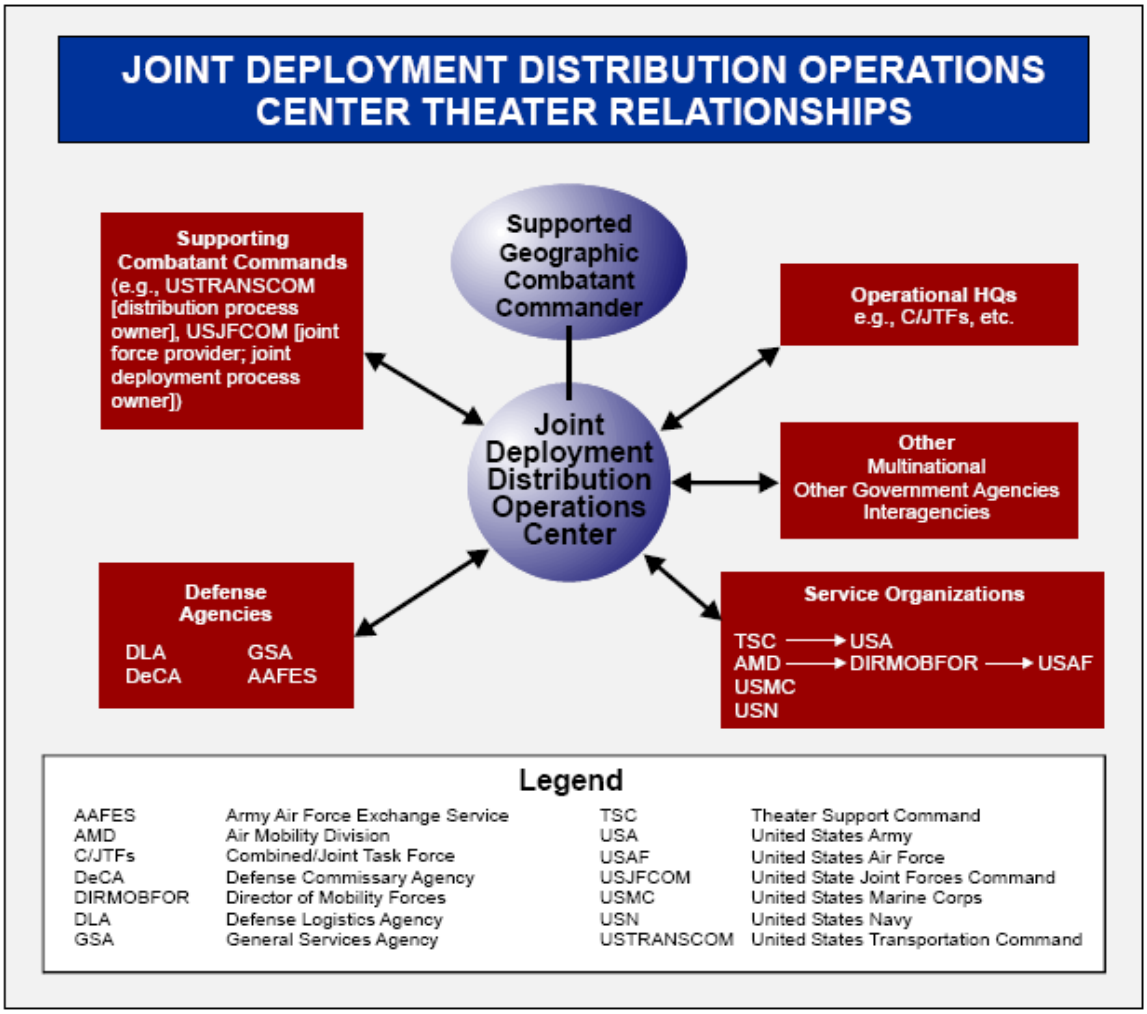
The JDDOC manning requirements reflect a scalable capability, consisting of three echelons:

- Echelon 1 - the *Core* which supports routine operations
- Echelon 2 - the *In-AOR Plus Up* to meet increased requirements

- Echelon 3 - *augmentees* as arranged with Service military departments, supporting commands (such as USTRANSCOM), and Defense agencies (such as DLA) for requirements that exceed available expertise in the Area of Responsibility (AOR)

The non-assigned Echelon 2 and 3 elements are considered national partners who help form an interdependent and collaborative relationship among USTRANSCOM, the Services, DLA, and other supporting organizations/activities to create an integrated and interdependent national-level and intratheater support capability for the supported combatant commander. Figure 3 provides a summary of theater organizational relationships in support of the JDDOC.

Figure 3. Joint deployment distribution operations center theater organizational relationships



The JDDOC serves as the single manager for intratheater distribution and force movements and the integrator of requirements and priorities for national-level supporting commanders on behalf of the joint theater force commander.

Army logistics doctrine

Title 10 requires the United States Army to provide all logistical support for its force structure, especially when its forces move ashore. As with all Services, the Army must provide support in terms of equipment, maintenance, medical, and all other support during operational missions. We present a generic description of Army logistics doctrine in this section.

If the Army is deployed to a remote theater of operations, Army logisticians may already have some personnel, equipment, and supplies prepositioned in theater. Other elements will still need transport to the theater. Because of this, those initial forces in theaters will need to support themselves without outside assistance for a short period of time.

The Army has recently implemented changes to its logistics command structures to better support the Army modular force restructuring. The Army Materiel Command is studying the establishment of an Army Sustainment Command to be its integrator for logistics readiness, acquisition, technology and distribution management functions. It is also establishing Army field support brigades (AFSBs) to oversee the logistics support elements (LSEs) providing support at the division/corps level and brigade logistics support teams (BLSTs) providing support at the brigade combat team (BCT) level. The Army also developed the concept of the joint-capable theater sustainment command (TSC) to plan, prepare, rapidly deploy, and execute operational logistics within an assigned area of operations. The TSC can also establish several deployable command posts (DCPs) into separate joint operational areas if requested by the joint force commander.

The TSC is designed to provide theater logistical support to the Army and, when required, to other U.S. forces. In particular, the Army provides logistical support to the U.S. Marine Corps once Marine Corps expeditionary forces push inland. Since the Marine Corps and the Army use much the same common warfighting materiel, rifles, ammunition, tanks, and other vehicles, it is only natural the Army perform these logistical services.

The Army, in its modernization plan, is moving towards a modular, brigade-centric force. This force will be expeditionary in nature with the expectation that these brigades can be deployed on a continual basis throughout the world. Within the modularization construct, there will be combat brigade teams and modular combat support brigades. It is the support brigades that will assume greater logistical responsibilities.These combat support brigades consist of fire brigades, sustainment brigades, battlefield surveillance brigades, and maneuver enhancement brigades. The sustainment brigades will provide the bulk of the logistics support needed by the BCTs. Ultimately, the Army currently plans to have approximately 15 active-duty combat brigades available for deployment. Presently, plans call for each of these brigades to contain between 3,300 and 3,900 personnel.

The intent of the new organizational structure is to deploy personnel and materiel more rapidly and still maintain asset visibility. Command structures will be constantly informed of where the soldiers are and what their immediate and long-term logistics needs are in order to complete their assigned mission. In addition, the brigade level soldier will have detailed information on when and where his/her needed supplies will arrive. This is essentially the goal of every logistics effort and is not unique to the Army.

The Army' intent is to have the TSC structure abandon the layered organizational concept and be built as a modular organization. These modular units and subunits will provide:

- Distribution of material, personnel consumables and durable equipment within theater
- Services related to the acquisition and distribution of petroleum
- Aviation services
- Civil engineering services
- Multifunctional supply, maintenance, and transportation support.

In addition, this new logistics structure is attempting to implement a concept known as "predictive technology". Predictive technology will

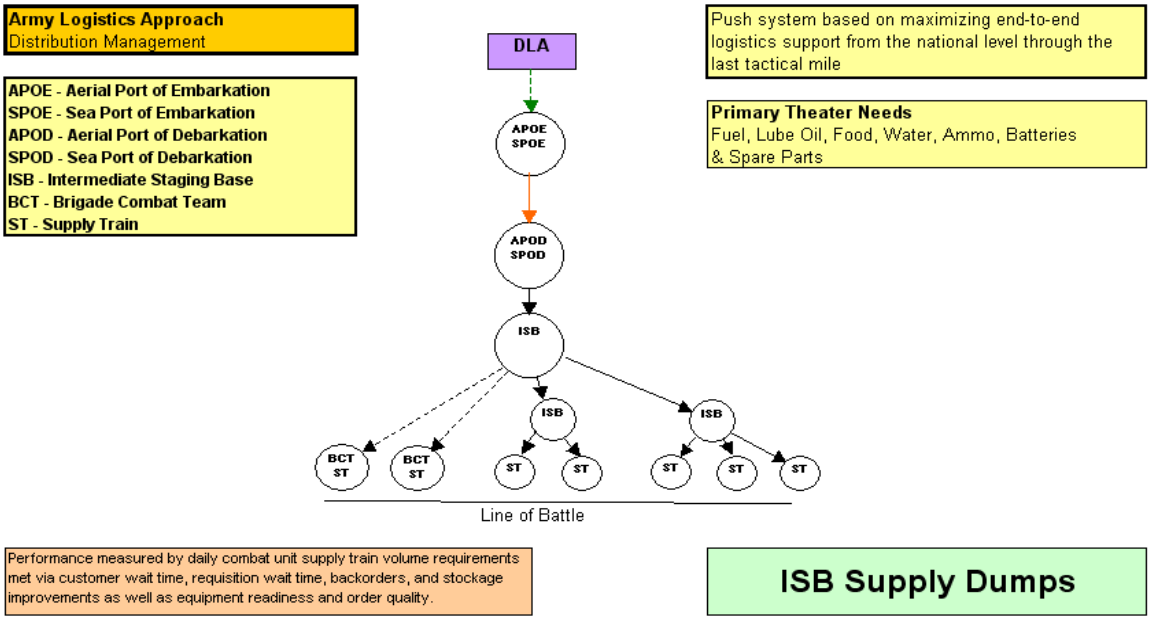
identify and take into account the current operational environment for all units and attempt to anticipate their material/supply needs. This is equivalent to the Marine Corps logistical approach known as "sense and respond". The same logistical concept is also known in the commercial/retail world as, "accurate response". Hence, there are three separate nomenclatures all of which refer to the same logistical operational concept. The overall concept of Army logistics doctrine is, in reality, no different than logistical doctrine in all Service branches and in nearly all commercial enterprises. The point of the logistics system is to deliver what the customer needs and when he needs it and do this consistently. Given the transformation efforts within the Army towards the brigade-centric concept, the Army is expecting to develop many small-capacity, and effective logistics networks to support the new BCT structure [13].

The Army faces many logistics issues not encountered by commercial operations. In a commercial operation, especially those located within CONUS, the logistics network is relatively static and can therefore be "optimized" in the sense that operations research models can be developed to calculate the maximum throughput of the system, where distribution nodes should be located, and where transportation capacity should be increased. In addition, in many cases demand forecasting models will drive the enterprise. For the Army, and for most of the Services as well, standard forecasting models, based on the concept of an auto-regressive integrated moving average process, are of little use due to the lack of stability in the temporal demand distributions for war-fighting materials [14].

The generic Army JTL approach under focused logistics is one of distribution management. The daily needs of combat forces within and along the line of battle, which constantly changes physical location, dictate a push-forward logistics system through intermediate staging bases (ISBs). The intermediate staging bases are of varying sizes and act as retention pools of materiel used to feed the outward-going supply vectors feeding more forward ISBs. The key measure is the materiel flow between the ISBs and, eventually, the individual combat unit supply trains.

The Army is shifting to a more distribution-based logistics system instead of the former supply-based structure. This results in larger organic supply trains embedded within the brigade combat team structures and moving material directly from a central theater-hub to the end-user bypassing some of the former intermediate supply control points thereby reducing the size and eliminating the need for some ISBs. Figure 4 provides a simplified diagram of the Army's JTL approach.

Figure 4. Army joint theater logistics approach



Distribution management refers to the control of the quantities of supplies being staged at each ISB and the delivery rates of the supply vectors pushing materiel forward and maximization of end-to-end logistics support from the national level through the last tactical mile. Key measurement indices are individual combat unit supply train replenishment requirements, ISB supply dump inventory levels, and delivery vector throughput capacity. The core elements to be measured are customer wait time, requisition wait time, backorders, and

stockage improvements as well as equipment readiness and order quality.

Air Force logistics doctrine

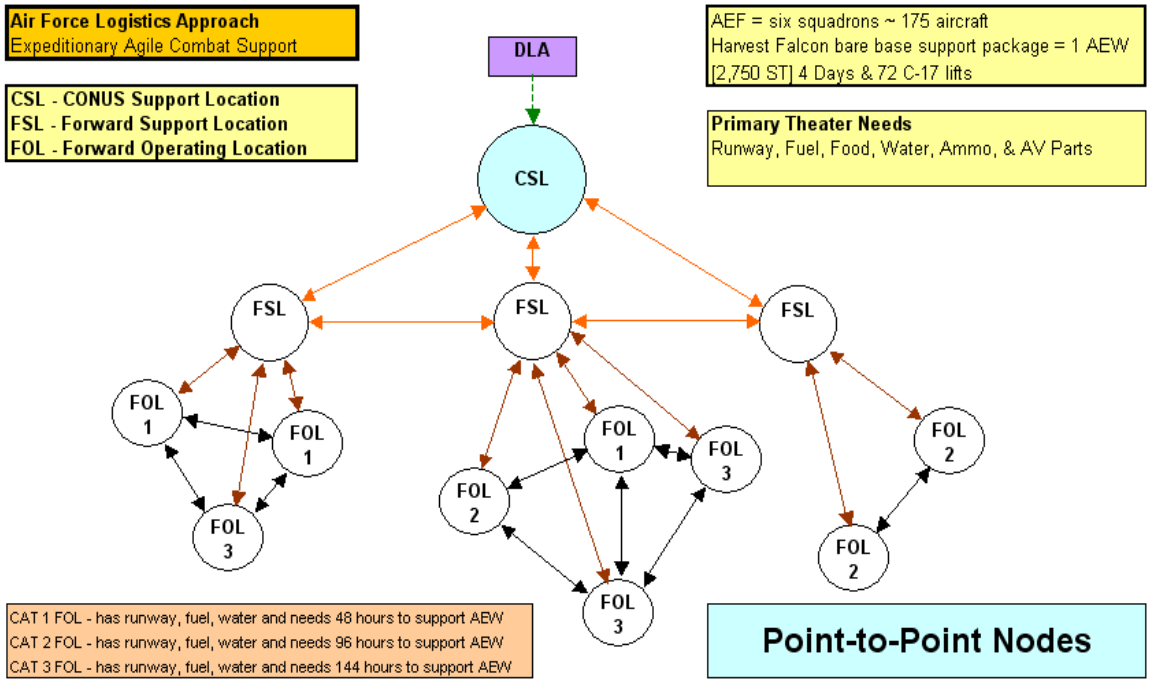
The Air Force faces an inherently different logistics problem, when compared to the Army or the Navy. Unlike the Army and the Navy, the Air Force requires a substantial, in-place infrastructure from which to conduct operations. This infrastructure may be provided by a host nation ally, as Saudi Arabia did in Operation Desert Storm, or by previously constructed air bases, such as Diego Garcia in the Indian Ocean. Diego Garcia served as a major base of operations during the conflict in Afghanistan and also for Operation Iraqi Freedom.

The Air Force logistics framework is based on five principles: responsiveness, sustainability, survivability, time-definite re-supply, and information integration. All of these principles are self-explanatory except for, "time-definite resupply." In the Air Force, that phrase refers to the standard logistics concept of having what you need delivered when and where you need it. In commercial operations this is also known as “just-in-time deliveries”. An additional implication of time-definite resupply is that lead-times for the order-delivery process are know with certainty or display very little variability. The lead-time is the time span between when an item is ordered and when it is delivered. When excessive variation in lead-times is present, the logistics process experiences significant problems since the delivery time is uncertain.

One major difference between the Air Force and the other Services is that its entire logistics operation reaches back to the Continental United States (CONUS). The Air Force does not preposition supplies and equipment in the same manner as, say, the Marines. For the Air Force, the source for all supplies, outside of what might be obtained locally from a host nation, originates in CONUS. The Air Force has a very small logistical footprint since the majority of supplies travel point-to-point. There is very little in the way of distribution of supplies in theater. In nearly all instances, the air base is the final destination for supplies arriving in theater [13].

The generic Air Force JTL approach under focused logistics is one of expeditionary agile combat support. The daily needs of combat wings located at the forward operating locations, coupled with limited air supply delivery vectors, dictate a reach-back pull-forward logistics system through air base transportation nodes. These air distribution nodes are of varying sizes and act as distribution receiving, sorting, and repackaging points used to feed other nodes. They generally do not serve as large storage facilities due to a just-in-time delivery approach which limits forward intermediate storage requirements. The key measure is the reach-back delivery time to the requesting forward operating location [15]. Figure 5 provides a simplified diagram of the Air Force's JTL approach.

Figure 5. Air Force joint theater logistics approach



Expeditionary agile combat support refers to just-in-time delivery of exact combat unit replenishment requirements at the forward

operating locations. Key measurement indices are individual combat wing operating requirements, time for reach-back delivery, and delivery vector air channel throughput capacity.

USMC logistics doctrine

The Marine Corps, more than any other Service branch, is "task-organized," meaning that they organize the necessary personnel, equipment, and logistical supply networks in response to the assigned military task or objective. The logistics doctrine for the Marines is more akin to a dynamic operation rather than a static logistics system, as exhibited by the Air Force.

The Marine Corps is an expeditionary force. By this we mean that it is capable of performing a wide range of military operations. These operations include amphibious assault and sustaining operations ashore in all environments. The Marines can operate from sea or land bases, or both. They are an all-in-one force, as Marines operate and maintain both a land and air force.

The Marines are organized around the Marine Air Ground Task Force or MAGTF. The MAGTF is organized once the military objective has been identified. The MAGTF consists of a ground combat element, an aviation element, and the personnel required to provide logistics and other support requirements to the MAGTF. Each MAGTF must develop two sets of logistics networks and protocols: one for the ground combat element and one for the aviation combat element. The Marine Corps is currently exploring an initiative to develop, if economically viable, a single logistics network and supply system for the ground and aviation combat elements.

Once the ground combat element moves ashore it eventually becomes dependent upon the Army logistics system for resupply. The time until this dependency occurs will depend on the operational tempo experienced by the particular MAGTF. For example, a Marine Expeditionary Force, when deployed ashore, takes with it a targeted 60-days worth of supplies. A Marine Expeditionary Brigade, when deployed ashore, has a targeted 30-days worth of supplies for sustained operations. Note that the 60 and 30-day supply numbers for the tow MAGTFs respectively, are not fixed

but are operational estimates of how long the MAGTF can sustain itself before resupply efforts are necessary.

The Marine Corps aviation combat element, under current doctrine, is tethered to the Navy and hence uses the Navy supply system and its logistical infrastructure for supplies specific to aviation support. The organization in charge of MAGTF logistics is the marine logistics group (MLG), formerly known as the combat service support group. This group organizes logistics efforts related to maintenance, medical/dental, supply, transportation, and engineering support.

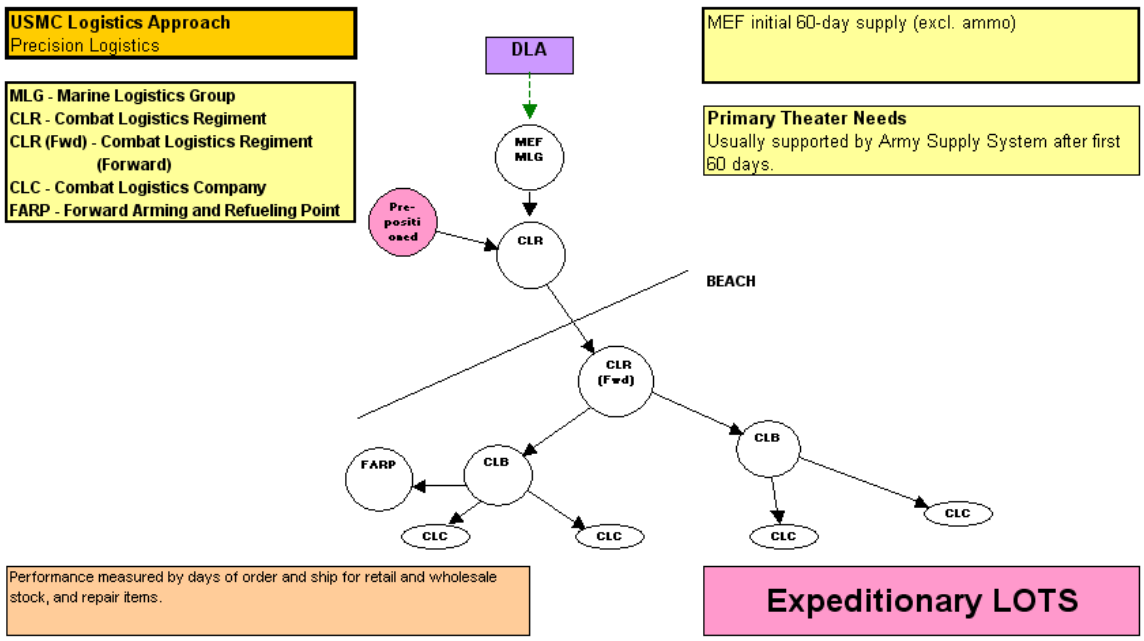
As with all Service branches, the generalized motto of the marine logistics group is to procure and deliver the right equipment/supplies at the right place at right time. The Marine Corps and Army logistics processes must overcome hurdles that the Air Force does not encounter. Whereas the delivery points for the Air Force are relatively fixed, the delivery points for Army and Marine Corps personnel move around and may be anywhere in the theater of operations [16].

The generic USMC JTL approach under focused logistics is one of precision logistics support. The expeditionary nature of Marine Corps operations requires rapid introduction of logistics over the shore from pre-positioned maritime assets as well as combat logistics force vessels. The USMC view of logistics identifies it as a set of integrated processes, in which actions occur on a linked chain, with inputs from one source being transformed into outputs that satisfy the next link in the chain. Once materiel is delivered over the beach to the combat logistics regiment (CLR), the USMC's land-based distribution approach is similar to the Army's, except that the throughput requirements are much less. The CLR has combat logistics battalions (CLBs) located forward which each support combat logistics companies and associated headquarters, service, and support companies. The USMC also uses a partial reach-back pull-forward system[10] for replenishment to keep their intermediate supply base

10. Unlike the USAF which reaches back all the way to CONUS, the USMC normally reaches back for the first 60 days to the combat logistic force or remaining pre-positioned ship assets which are much closer to the theater of operations.

equivalent footprints smaller and more relocatable [17]. Figure 6 provides a simplified diagram of the Marine Corps' JTL approach.

Figure 6. U.S. Marine Corps theater logistics approach



Precision logistics support refers to a management methodology of Define-Measure-Improve for each process link that makes up the linear supply chain. Key measurement indices are individual combat unit operating requirements, time for partial reach-back delivery, and delivery vector throughput capacity.

Navy logistics doctrine

For the most part, the problems and issues encountered by naval logistics officers have changed very little since World War II. The transportation infrastructure used by Navy ships, namely the open oceans, have not and will not change. What has changed is the ability

for commanders to have, in some cases, real-time information on the location of naval assets in the theater of operations. This is commonly referred to as "asset visibility" in today's military. The importance of knowing the location of all significant assets has become a high priority for commanders.

The Navy has tremendous capital assets that can be devoted to move large amounts of cargo and supplies. The Military Sealift Command operates and manages over 100 ships in its fleet. These ships include oilers, container ships, fleet ocean tugs, and other general supply ships. The Military Sealift Command transported the vast majority of war equipment used by all Services in Operation Iraqi Freedom to the theater of operations. In fact, 459 shiploads of materiel were delivered prior to the Iraqi invasion. For operations Desert Storm and Desert Shield, the Military Sealift Command transported and delivered approximately 90 percent of all materiel to the operational theater. This solidifies the critical importance of the Navy's sealift capabilities. Hence, in terms of transporting the war machine to the fight, the Navy is the central player [18].

Unlike the Army's logistics operations, naval logistics operates essentially the same in war as it does in a time of peace. The only difference is in the operational tempo. The one exception could be the resupply of ammunition to the combat logistics force in the unlikely event that the pace of battle causes the fleet to exhaust its stock of munitions. During wartime conditions, the operational tempo obviously increases, but in today's world, the naval logistics process, especially the actual transportation of fuel and materiel, is unimpeded by the enemy.

Logistics doctrine encompasses three levels: strategic, operational, and tactical. These levels are not restricted to naval logistics but apply to all branches of the armed Services [19].

Strategic logistics focuses on the ability of the United States to execute the overall military strategy. Logistics at the strategic level takes an overall look at the nation's manufacturing base and transportation system and subsequently identifies any inherent weaknesses that may exist.

Operational logistics is concerned with providing the combatant commander with the resources and logistics support required to meet the military objective. It includes those activities required to sustain major theater operations and is the level at which joint logistics operations are coordinated.

Tactical logistics essentially focuses on obtaining logistics support for a deployed battle group. The support functions comprising tactical logistics include engineering, maintenance, battle-damage repairs, arming, fueling, cargo handling, and intra- and intertheater transportation. Tactical logistics can be thought of as focusing on providing all of the short-term logistical needs of the battle force.

All three levels are related, with tactical logistics contained within operational limitations and operational logistics contained within strategic limitations.

The overall mission of naval logistics, as has been stated previously, is to deliver the right supplies where they are needed. Within the naval logistics process there are six identified functional areas: supply, transportation, maintenance, engineering, health services, and other Services.

It is easy to see how the first four areas are critical to a successful logistics process. Health services are included under the logistics umbrella because, in order to provide adequate health support to the military force, they must be near the theater of operations. This requires special logistical considerations as medical supplies are very delicate and in many cases have a short shelf life. Therefore, it is critical to have a supply network in place that can move specialized medical supplies and personnel to where they are most needed.

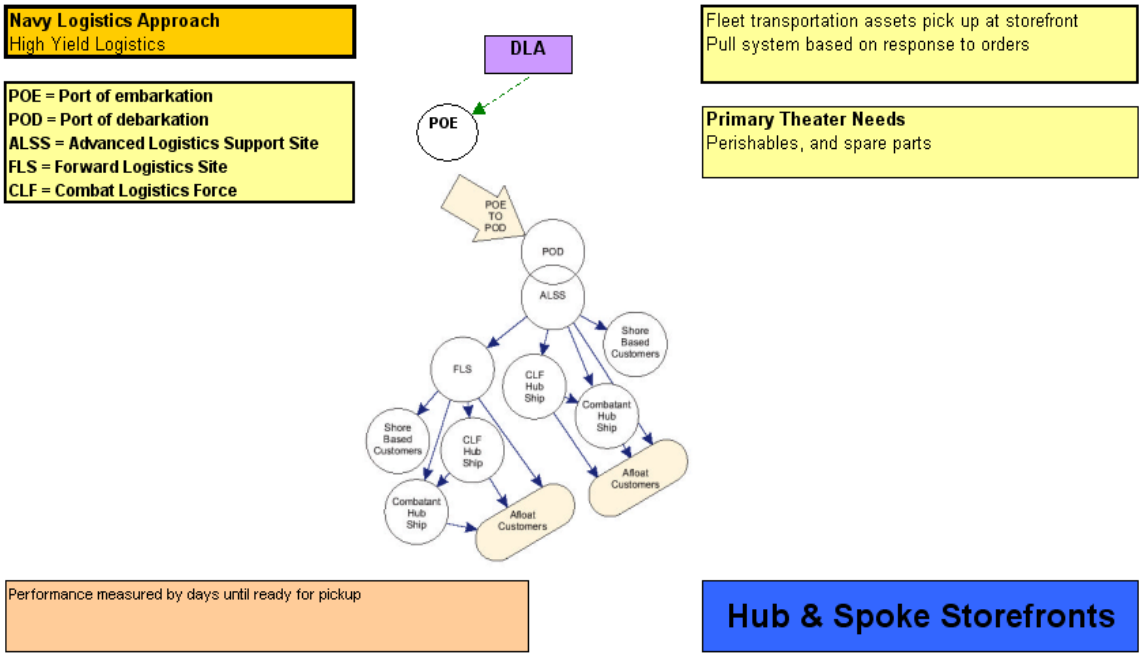
Four elements comprise the naval logistics process: acquisition, distribution, sustainment, and disposition. As with the six functional areas mentioned earlier, the four elements are self-explanatory. In this report, we focused on the distribution element in a joint logistics environment [19].

Distribution refers to the methods used to deliver materiel, personnel, and other support services to the operational commander.

Distribution encompasses the principal capital assets owned by the Navy that could be shared in a joint theater logistics environment. These assets include ships and helicopters which are discussed fully in the section on common lift capabilities.

The generic Navy JTL approach under focused logistics is one of high-yield logistics support. The long-term deployment nature of naval operations, along with the large internal supply capacity of ships, allows fleet operations for months at a time with resupply accomplished by accompanying combat logistics force vessels. The external needs of the fleet center on replenishment of perishables and spare parts which results in a reach-back logistics pull system based on a response to combat vessel/unit orders. The Navy distribution system is described in doctrine as a hub and spoke system [19]. The Navy operates a world-wide network of storefronts at regional Advanced Logistics Support Sites (ALSSs) and also at more local Forward Logistics Sites (FLSs) to allow fleet transportation assets to pick up waiting perishables and spare parts. Figure 7 provides a simplified diagram of the Navy's JTL approach.

Figure 7. Navy joint theater logistics approach



High-yield logistics support is made up of three main initiatives [20]:

- Technology insertion–develop repair parts that are engineered for longer life and optimal performance to reduce spare parts requirements.
- One touch supply–adapt the distribution system to reduce delivery order times through best-value suppliers, integrated systems and technology, customer-centered metrics, and tailored customer support.
- Regional maintenance–redistribute equipment maintenance work within the geographic regions to regionalize the work for

better utilization of facilities and personnel at a lower overall cost.

The key measurement indicia is time for reach-back delivery or customer wait time.

Common lift capabilities

Military transportation assets are designated for use as Service mission (dedicated to internal Service operations) or common user support (available for tasking by all Services). This section presents a brief discussion of the current common lift transportation capabilities. We outline and describe the equipment inventories owned and operated by each Service branch, respectively. These assets are identified as either strategic assets or tactical assets. Strategic assets are those which are used to transport materiel from the buyer, whether DLA or the individual Service, and the in-theater port of debarkation (POD). Tactical lift includes those assets used within the theater of operation from the POD to the end user. In some cases, assets can be utilized and considered as both strategic and tactical.

Strategic

We begin with the issue of how we decide if transportation assets are strategic or tactical. Two criteria determine whether a common use asset is considered strategic or tactical. The first as mentioned above, is determined by the portion of the distribution chain being supported. Everything from outside the combatant commander's theater to the POD is strategic and everything from the POD to end users within the theater is tactical. Assets can also be considered strategic if they are under the control of, and can be tasked by, USTRANSCOM.

Land lift

How might we identify strategic land lift and what assets should be classified as such? The Military Surface Deployment and Distribution Command (SDDC) is the Army's service component command that has been assigned to USTRANSCOM and provides the common use assets of trucks, trains, and barges. SDDC is the DOD executive agent for common-user land transportation (CULT) and most of these assets are considered tactical rather than strategic. However some

assets can be classified as strategic if they are used to transport material destined for an in-theater POD. The majority of in-theater assets, such as trucks, are considered tactical.

U.S. Army

The strategic land lift assets of the United States consist of some 2,150 railcars and approximately 105 locomotives of the National Defense Reserve Fleet (NDRF) which are managed by the SDDC. The railcars include stub-sill tank cars, flat cars used for intermodal/piggyback operations, and standard boxcars. These cars can form stand-alone military trains or also can be delivered by domestic freight railroad companies.

The Army also owns 3,300 flatrack palletized loading trucks and 735 tractor-trailer rigs. All of these trucks are capable of accommodating palletized loads. Flatrack trucks are multi-axle, single frame vehicles. All of these trucks are considered both strategic and tactical assets as these vehicles could be transported to the theater of operations [21].

The Army does not currently own any river barges.

U.S. Air Force

The Air Force does not own any land transportation equipment that could be considered a common user lift asset.

The U.S. Navy and Marine Corps

The Navy and Marine Corps do not own any equipment that could be classified as common user land lift assets.

In conclusion, table 1 provides a listing of strategic land lift transportation assets. The majority of strategic land lift is supported by the Army, through SDDC and USTRANSCOM, and is conducted predominately within CONUS.

Table 1. Strategic common user land transportation assets

Asset	Description	Number	Unit Capacity
Railcars	Boxcars	2,150[a]	75 tons
Railcars	Tankcars		34,000 gallons
Railcars	Flatcars (Intermodal)		75 tons

a. This is the total number of boxcars, tankcars, and flatcars together

Airlift

How might we identify strategic airlift and what assets should be classified as such? This is more difficult to address than the strategic land asset question. The Air Mobility Command (AMC) is the Air Force's service component command that has been assigned to USTRANSCOM and provides the bulk of the common use air assets. The assets under USTRANSCOM control are considered strategic. The remaining AMC and Service common user air assets are considered tactical.

U.S. Air Force

The Air Force operates the majority of assets that can be classified as strategic common airlift assets. These strategic airlift assets include the C-5 Galaxy, the C-17 Globemaster, the KC-10, and the KC-135. The C-5 Galaxy and C-17 Globemaster are cargo aircraft, while the KC-10 and KC-135 are tanker aircraft. The United States has an inventory of 126 C-5 Galaxy aircraft that can be devoted to strategic airlift. This includes 80 aircraft in active duty, 14 assigned to the Air National Guard, and 32 assigned to the Air Force Reserve. This aircraft has a payload capacity of 145.5 short tons. With in-flight refueling, the aircraft has worldwide access to deliver cargo and supplies.

A total of 126 C-17 Globemaster cargo aircraft are currently in inventory. This includes 118 aircraft in active duty status and eight in the Air National Guard. The C-17 has a payload capacity of 86 short tons

and with, in-flight refueling, can also deliver cargo and supplies worldwide.

The strategic airlift base also contains 72 C-141 Starlifter cargo aircraft, but none of these are in active duty and are currently in storage. This aircraft can accommodate approximately 44.5 short tons of cargo [21].

USTRANSCOM also operates and controls 352 C-130 cargo aircraft. This aircraft can haul approximately 21 short tons of cargo and also has an in-flight refueling capability.

Also available in inventory are 59 KC-10 aircraft and 535 KC-135 tanker aircraft. Of these 535 KC-135 aircraft, 506 are in active duty, eight are assigned to the Air Force Reserve, and the remaining 21 are assigned to the Air National Guard. Tanker aircraft are part of the strategic airlift asset mix as these aircraft are responsible for the worldwide delivery capabilities of the C-5s, C-17s, and C-141s.

In addition to the aircraft cited above, USTRANSCOM has access to approximately 430 additional military aircraft under its tasking jurisdiction. Finally, USTRANSCOM has commercial access to 1,000 additional aircraft in the Civil Reserve Air Fleet (CRAF).

U.S. Army

Although the United States Army owns and operates a significant number of rotary winged aircraft, none could be considered part of the strategic airlift inventory for two reasons: 1) these assets are primarily devoted to transporting Army personnel and equipment, and 2) these assets offer transportation over a short distance. All cargo aircraft/helicopters owned and operated by the Army are considered tactical airlift assets.

U.S. Navy and Marine Corps

Neither the Navy nor the Marine Corps has any strategic airlift assets.

In conclusion, the majority of the strategic airlift capability consists of the C-5 and C-17 aircraft. However, the tankers are included as essential parts of the strategic airlift assets as they permit the C-5s and C-17s

to operate worldwide. Table 2 provides a listing of strategic airlift transportation assets.

Table 2. Strategic common user air transportation assets

Asset	Description	Number	Unit Capacity
C-5	Heavy-lift cargo aircraft	126	143.5 tons
C-17	Heavy-lift cargo aircraft	126	86 tons
C-141	Medium-lift cargo aircraft	72[a]	43 tons
C-130	Medium-lift cargo aircraft	480	21 tons
KC-10	Aerial refueling transport aircraft	59	178 tons
KC-135	Aerial refueling aircraft	530	101.5 tons

a. Currently held in storage as strategic reserve.

Maritime lift

How might we identify strategic maritime lift and what assets should be classified as such? The Military Sealift Command (MSC) is the Navy's service component command that has been assigned to USTRANSCOM and provides the common use sea-going assets. The common use sealift assets under MSC are considered strategic.

U.S. Navy

USTRANSCOM controls a fleet of 87 ships, all of which belong to the MSC. These ships are capable of transporting all types of cargo including fuel, rations, ammunition, heavy military equipment such as tanks and assault vehicles, and general consumable items. These ships give the United States a tremendous capacity for transporting military equipment and supplies throughout the world. In addition to the 87 ships operated by MSC, 360 commercial vessels can be tasked via the Voluntary Intermodal Sealift Agreement (VISA), which is also managed by MSC [22].

U.S. Army and Air Force

Neither the Army nor the Air Force have any strategic sealift assets.

U.S. Marine Corps

The Marine Corps does not maintain any strategic sealift assets of its own.

In summary, the Navy's MSC provides the sole source of strategic sealift. Due to the large capacity of sea-going cargo vessels, the majority (95 percent or more) of all strategic cargo lift goes by sea. Table 3 provides a listing of strategic sealift transportation assets.

Table 3. Strategic common user sealift transportation assets

Asset	Description	Number	Unit Capacity
T-AKR	Large, medium-speed roll-on/roll-off ships	11	20,000 long tons
T-AKR	Fast sealift ships	8	16,000 long tons
T-AOT	Transport tankers	4	173,000 barrels
MV	Transport tanker	1	531 long tons
MV	Container ship	1	25,000 long tons
MV	Ice-strengthened container ship	1	25,000 long tons
T-AKR	Large, medium-speed roll-on/roll-off ships	31[a]	20,000 long tons
	Breakbulk	3[b]	26,000 long tons

a. Currently held in ready reserve.
b. Currently held in ready reserve.

Pre-positioned

When discussing strategic common lift capabilities, it is important to address pre-positioned forces and equipment. By its nature, all pre-positioned transportation assets are considered strategic. There are no tactical pre-positioned assets.

U.S. Navy

The MSC provides afloat pre-positioning support to all the Service branches, Army, Navy, Marine Corps, and Air Force. In addition, it provides pre-positioning support to DLA. MSC's pre-positioning program consists of 36 ships. They are nominally located in Guam, Diego Garcia, the Arabian Gulf, and Italy, but can rapidly deploy to wherever the preloaded cargo is required. Within the pre-positioning program is the logistics pre-positioning force. This force consists of ten vessels operating around the globe supporting the Navy, the Air Force, and the Defense Logistics Agency. The ships supporting the Air Force predominately carry munitions. Those that support the Navy primarily carry ordnance and other types of modular cargo. The ships supporting DLA consist of two petroleum tankers that carry different types of fuel. Three ships support Marine operations. One ship, a high-speed vessel, is capable of ferrying 970 Marines and their equipment along with an additional 420 tons of cargo. Two other ships are aviation logistics ships and are devoted to supporting two Marine air wings. They carry a variety of aircraft spare parts and accessories as well the equipment necessary to provide afloat intermediate maintenance level support for the aviation combat element of the Marine Expeditionary Force. One ship is stationed on the East Coast, the other on the West Coast, and either can depart its home port within 5 days once given the go-ahead to proceed [23].

Table 4 provides a listing of strategic afloat pre-positioned transportation assets.

Table 4. Strategic common user afloat pre-positioned transportation assets

Asset	Description	Number	Total Capacity
CPF[a]	USA large, medium speed, roll-on/roll-off (LMSR) vessels	8	198,700 long tons
CPF	USA ammunition vessels	2	5,000 containers
MPF[b]	USMC large, roll-on/roll-off vessels	13	287,000 long tons
MPF	USMC MPF enhanced vessels	3	66,500 long tons

Table 4. Strategic common user afloat pre-positioned transportation assets (continued)

Asset	Description	Number	Total Capacity
MPF	USMC aviation repair vessels[c]	2	16,200 long tons
LPS[d]	USN ammunition vessel	1	8,280 long tons
LPS	DLA oiler/fuel vessels	3	31,250 long tons
LPS	USAF ammunition vessels	4	3,540 containers

a. Combat Prepositioning Force (CPF)-Army dedicated vessels with equipment, food, water, and other supplies to support two Army heavy divisions, up to 34,000 personnel, for 30 days.
b. Maritime Prepositioning Force (MPF)-USMC dedicated vessels divided into three squadrons to provide 30 days' support for a Marine Corps Expeditionary Brigade (MEB) of 17,300 personnel.
c. The SS *Curtiss* and SS *Wright* aviation maintenance logistics ships are maintained in a reduced operating status and can be fully activated in 5 days.
d. Logistics Prepositioning Ships (LPS)-USAF, USN, and DLA dedicated vessels providing ammunition and fuel support.

Tactical

We now focus on the tactical lift capabilities of the armed forces. A tactical asset is defined as one that is confined for use within a given theater of operations and most likely is confined for use by a particular Service branch. It is difficult to separate and identify Service dedicated logistics lift from common use assets because the equipment can be used for either and frequently changes designation.

Land lift

As previously mentioned, the U.S. Army owns 3,300 flatrack palletized loading trucks and 735 tractor-trailer rigs. All of these trucks are capable of being used as tactical land lift vehicles. The flat rack trucks, similar to a flat-bed truck, are large, long-frame, heavy-duty trucks that can haul up to 16.5 short tons. They have a single frame. A trailer can be hitched behind the flat-bed to allow a total hauling capacity of 33 short tons. The tractor-trailer rigs are similar to those used by commercial operations in the United States. The Army also possesses the

only military-owned and operated Heavy Equipment Transporter (HET) assets. The HET system consists of the M1070 truck tractor and M1000 heavy equipment transporter semi-trailer which can haul up to 70 short tons.

One limiting factor for using these vehicles in tactical operations is the difficulty in getting them to the theater. However, the critical constraint is the need for an adequate road infrastructure within the operating theater. Trucks such as these are of lessor value in areas such as Afghanistan, where the road system is limited and in poor condition.

The Marine Corps does not own any significant resources that could be devoted to tactical land lift efforts as the Marine Corps is predominately an expeditionary force. While, the Marines operate 94 light assault vehicles that could be used to transport supplies, this is a very limited resource, as these assets are designed to transport personnel and their warfighting gear rather than logistical supplies. The Marine Corps also has numerous trucks and cargo high mobility multipurpose wheeled vehicles that can haul supplies within each brigade, however these are not normally available for common use. Once the Marines move ashore, their ground combat operations are eventually supported by the Army logistics system.

The Navy and Air Force essentially have no tactical common user land lift assets.

In summary, table 5 provides a listing of tactical land lift common use transportation assets.

Table 5. Tactical common user land transportation assets

Asset	Description	Number	Unit Capacity
Trucks	Tractor-Trailer	735	20 tons
Trucks	Flat-rack	3,300	16.5 tons
HET	Heavy Equipment Transporter	2,693	70 tons

Airlift

The tactical airlift assets are difficult to identify directly, as the numbers vary depending on the source. This is especially true when looking at the C-130 aircraft and its variants. The Air Mobility Command has 480 C-130 aircraft in its inventory and each aircraft has a cargo capacity of 21 short tons [24]. The C-130 aircraft represent the dominant asset in tactical airlift, as they can operate from shorter runways than both the C-5 and the C-17 aircraft. The Air Mobility Command also has 5 C-9 Nightingale medium-lift passenger/cargo aircraft. These aircraft are currently used primarily for distinguished visitor operations.

The Marine Corps has 24 KC-130s in active duty and the Navy operates an additional 20 C-130Ts[11] which could be committed to common tactical airlift operations [21].

In addition to the C-130 aircraft that could be committed to tactical airlift operations, the Army and Marine Corps have helicopter assets that could provide significant capabilities. The Army has approximately 239 CH-47 Chinook helicopters, each with a cargo capacity of 7 short tons. The Marine Corps operates 149 CH-53 Sea Stallion helicopters, each with a cargo capacity of 9 short tons. They also operate 180 CH-46E Sea Knights which have a cargo capacity of 2 short tons. These CH-46Es will be phased out once the MV-22 Osprey's reach initial operating capability in September 2007.

The Navy does not own any aircraft that normally could be used for common tactical airlift operations. Although some of the aircraft could be used for common use, they are dedicated to organic fleet support and specialized missions which make them unavailable. In addition to the C-130Ts mentioned above, the Navy flies C-2A, C-9B, C-20G, C-37B, C-40A, and DC-9 fixed winged aircraft which have varying cargo carrying capacities. There are also over 300 H-60 type rotary wing assets as well as SH-3H and MH-53 models which are dedicated to fleet operations support.

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11. One of the Navy C-130T aircraft has been modified with aerial refueling pods on the wings and redesignated as a KC-130T.

In conclusion, the majority of the tactical common use airlift capability consists of the C-130 aircraft and CH-47/53 heavy-lift helicopters. Table 6 provides a listing of common user tactical airlift transportation assets.

Table 6. Tactical common user air transportation assets

Asset	Description	Number	Unit Capacity
CH-47	Heavy-lift cargo helicopters	239	7 tons
CH-53	Heavy-lift cargo helicopters	149	9 tons
C-9	Medium-lift passenger/cargo aircraft	5	10 tons
C-130	Medium-lift cargo aircraft	480	21 tons

Maritime lift

The United States does not have any ships that could be directly defined as maritime tactical lift assets. Nearly all of the cargo/supply ships are either directly supporting naval operations, such as the Naval Fleet Auxiliary Force, or are part of strategic maritime lift operations. The Navy has 34 LCU class auxiliary craft which can carry up to 180 short tons. The Navy also has 91 LCAC auxiliary craft which can carry up to 60 short tons within a range of 200 nautical miles. Both these vessels are predominately used to support amphibious operations and logistics over the shore movements.

The Army has numerous watercraft (LSV, TSV, LCU-1600, LCM-8, and LCU-2000) which are common user designated and are capable of moving barges and transferring material for JLOTS operations and port and terminal operations. While essential equipment for local transfer of materiel from ship-to-ship and ship-to-shore, we did not include these assets in our review due to the limited range and specialized use.

To summarize, the majority of existing tactical lift capacity is land-based and coordinated by the Army. The rest is air-based using predominately C-17s and C-130s and is coordinated by the Air Force. The Navy does not have any transportation assets that can be routinely used for common tactical lift support.

Joint theater logistics requirements

Next, we explore the joint theater logistics requirements of both the COCOM and the individual Service components. The specific theater logistics requirements are significantly different for each of the combatant commanders depending on the nature of the AOR and potential theater adversaries. However, there are several general needs that are the same across the COCOMs.

COCOM theater logistics needs

The COCOM's tactical logistics requirements start with an ability to implement a "sense and respond" type of logistics support. This type of approach recognizes that demand can be unpredictable, so success depends on the speed of pattern recognition and speed of response. The best supply chain is no longer one that is highly optimized, but one that is highly flexible. This system organizes units and subunits into modular capabilities that negotiate with one another over commitments. The logistics networks self-synchronize via a common environment and set of shared objectives. Finally, the system uses information technology for data sharing, rapid data collection, commitment tracking, and role reconfiguration. In order to accomplish these goals, the COCOM needs to develop the following capabilities [25]:

See/sense – The capability to plan, monitor, and assess in real-time, allowing control of deployment/redeployment, distribution, employment, regeneration, and sustainment across the entire theater of operation.

Respond – The capability to prioritize, direct, synchronize, integrate, and coordinate common user and cross-service logistics materiel and functions within their AOR.

Collaborate – The capability to fully collaborate with other COCOMs, Service components, joint task forces, interagency organizations, and coalition partners, to achieve the ability to see, sense, and respond.

Focused Logistics Wargame (FLOW) 2003 tasked the Joint Staff to form a flag-level joint theater logistics process action team to identify critical warfighter desired theater logistics functional capabilities [25]. Table 7 provides a summary developed by the process action team of the critical JTL capabilities and an evaluation of the level of achievement.

Table 7. Joint theater logistics management critical capabilities

Capability	Evaluation[a]
See & sense	
Joint force projection & reception	RED
Optimize sustainment of joint forces	YELLOW
Interoperable logistics technologies	BLACK
Monitor health of forces	GREEN
Engineer contingency planning	RED
Respond	
Joint priorities mgmt (sustainment materiel)	RED
Synchronize inter- & intratheater deploy & dist	RED
Direct assigned intratheater trans assets	YELLOW
Joint munitions mgmt	YELLOW
Joint petroleum mgmt	GREEN
Joint subsistence & water mgmt	YELLOW
Joint common item repair & maintenance	YELLOW
Joint infrastructure & engineer asset mgmt	RED
Joint theater contracting and contracts mgmt	RED
Joint financial mgmt support	YELLOW
Joint medical support - protect joint forces	GREEN
Bare base assets	YELLOW
Mortuary affairs	YELLOW
Personnel support	GREEN
Security and military police	YELLOW
Collaborate	
COCOMs/JTFs/Service components	RED
Interagency organizations	RED
Multinationals	RED

a. The capability assessment was evaluated through four levels of achievement: GREEN–Effectively provides required JTL capability or functional element. YELLOW–Adequately achieves required JTL capability or functional element. RED–Severe deficiencies in ability to achieve required JTL capability or functional element. BLACK–Little or no ability to achieve required JTL capability or functional element.

The nine red and single black capabilities assessments should provide the initial functions to evaluate for maritime support potential.

U.S. Army theater support needs

Tactical lift capabilities within theater are very important for the Army due to the limited supply train capacities of their forward combat units. The Army has an almost daily requirement to resupply mobile units with water, food, fuel, batteries, spare parts, and ammunition. This critical need to maintain a constant logistics flow, no matter what the circumstances, is why the Army focuses so much on the "last tactical mile."

The Army also must deal with a wide range of numbers and types of units supported, depending on the nature of the conflict. Being a push type of system, their logistics processes react slowly to changing field requirements and in practice this is accommodated by building up supplies at ISBs to maintain the proper flow rates to the forward unit supply trains. A former light infantry division of 11,520 troops, for example, had a deployment weight of 18,122 tons. This included the weight of the soldiers, their personal gear, and all equipment. It also included 1 day of ammunition; 5 days of rations, construction materials, and personal items; and a 15-day supply of clothing, petroleum products, medical supplies, and spare parts. This weight does not include the weight of the additional external combat and support units. These supporting light divisions deployed with 3,841 vehicles and 83 aircraft. To move this force required 61 C-17 sorties. A former heavy armor division, by contrast, weighted out at 102,052 tons with 17,186 troops and 8,125 vehicles (1,249 of which were tracked) [26]. This shows the tremendous range of support that Army logisticians must plan for and then execute.

As mentioned previously in this report, the Army is in the process of transforming itself to a lighter, brigade-centric force that is designed to be more expeditionary. The combat units are being reorganized into heavy, infantry, or stryker brigade combat teams (BCTs). The division level command and control headquarters are organized based upon assigned mission with a combination of BCTs and selected support brigades. A greater percentage of combat service

support is now embedded at the BCT level allowing independent actions for up to 72 hours. This shift to a more distributed logistics support system along with more robust unit supply train capacities is resulting in some changes to how Army theater logistics support needs are met.

The Army is shifting away from a supply-based system to a distribution-based theater logistics system. The distribution will rely more on moving materiel from a theater-hub directly to the end-user thereby bypassing and eliminating the requirement for some intermediate staging bases. The expeditionary strategy requires the BCTs to be more self-sufficient for longer periods of time than units had to be in the past. The brigades, with between 3,300 and 3,700 personnel, must deploy with roughly enough supplies to sustain them for 30 to 60 days. The actual requirement will depend upon operational tempo, location, assigned mission, and actual number of personnel assigned to the brigade.

To support this distribution-based approach, the Army is focusing on certain current problem areas:

- Making Army logisticians a more integral part of the battlefield structure
- Perfecting distribution-based logistical procedures
- Improving the Army's ability to receive forces in theater
- Improving the integration of the total supply chain
- Developing a more pro-active and responsive logistics system with precise asset visibility throughout the theater of operations

Historically, the Army has relied heavily on land transportation as the bridge to link the intermediate staging bases back to the theater aerial ports of debarkation (APODs) and sea ports of debarkation (SPODs). Logistics force protection has not been a major consideration in past conflicts due to support operations generally being behind the line of battle and not seriously exposed to enemy forces. However, recent experiences in Iraq have forced the Army to adjust to an Improvised Explosive Device (IED) threat to supply channels that is similar to the mine threat for ocean-going maritime lift. As

early as February of 2005, the Central Command's DDOC changed the logistics delivery process to have strategic airlift extend past the traditional APODs directly into FOLs capable of handling the larger aircraft. A hub-and-spoke air bridge system was established to re-fly just delivered cargo to smaller FOLs where the smaller C-130 aircraft could be accommodated. This required an increase in the number of tactical airlift assets assigned, but has mitigated the threat for at least 250 additional truck drivers per week [27]. This adjustment was consistent with the overall shift to a distribution-based central-hub direct to end-user logistics system discussed earlier.

U.S. Air Force theater support needs

The Air Force theater needs are very different from the Army's. The nature of Air Force operations is dictated by being tied to physical locations with runways. Their node-to-node logistics system lends itself to greater strategic lift insertion depending on the capacity of their FOLs. Tactical aircraft form the bridges between their FOL logistics nodes, creating a network with global reach back capability and an ability to transfer materiel between nodes to balance support. However, all their FOLs are located on what amounts to foreign rental property, which can result in restrictions and loss due to host nation sovereignty issues.

The Air Force requires the same consumables support as the Army for fuel, food, water, ammunition, and spare parts, although at much reduced levels due to fewer numbers of personnel. The key difference is the requirement for an operational runway that can support strategic airlift requirements or close enough to other FOL nodes to allow tactical airlift connection. The Air Force focuses on the ability to establish combat sortie operations at any bare base location in the world as quickly as they can. They have developed a Table of Equipment (TOE) called "Harvest Falcon" that is designed to support one fighter squadron at any bare base. It consists of water treatment, food preparation, and personal hygiene facilities; power generation equipment; flight line lighting, power, operations, and maintenance support. Industrial shelters and utilities for back-shop operations and all other base operating services round out the package. The package

weighs more than 4,500 tons, not including personnel, and requires 72 C-17 sorties to deliver on-site [28].

In summary, the Air Force has historically relied on airlift to support their forward support locations (FSLs) and FOLs. Reliable and timely land bridge support from SPODs could save the Air Force a considerable amount of annual operating funds. They could also speed up their expeditionary response if they went to an afloat pre-positioned Harvest Falcon package. Due to their need for maintained runways and parking aprons in remote locations, the Air Force could find construction and repair engineering support from the Navy very helpful.

U.S. Marine Corps theater support needs

The Marine Corps has always been expeditionary in nature and has focused on amphibious assaults from the sea supported by logistics over the shore for the first 60 days. After this time, if still engaged in theater, they were to shift to the Army logistics distribution system to feed their combat logistics regiment (CLR).

The Marine Corps has similar needs to the Army for their fighting forces, but has fewer personnel and much smaller supporting operations. A typical Marine Expeditionary Force (MEF) of 6,806 personnel (which is only the landing force) requires 14.97 tons of food, 189.89 tons of water, 225.01 tons of fuel, 33.48 tons of ammunition, and 26.54 tons of other cargo (such as spare parts) each day. This totals 489.89 tons of support each and every day. For a full MEF forward of 17,800 personnel this daily requirement jumps to 2,235 tons [29]. Since the Marine Corps combat unit supply trains are just as limited in capacity as the Army's, they also focus heavily on daily resupply needs and a push type of distribution system. When the distances from ports to combat units are long (e.g., over 50 miles), a Marine Logistics Command (MLC) may be added to conduct port activities, receive and store incoming materiel, and provide long-haul land transport to the CLR.

As with most other aspects of its operations, the Marine Corps is adept at tailoring logistics support to the mission at hand, and the basic techniques employed provide a great deal of flexibility. The ability to

directly deliver substantial amounts of materiel over 50 miles inland from the Navy seabase would be very helpful.

U.S. Navy theater support needs

As indicated earlier, the Navy theater requirements are unique within the Services. Since the internal supply capacities of ships are so large, they load up prior to deployment and the only major item of sustainment is non-routine spare parts. Ships generally make their own water, and draw at-sea additional fuel and ammunition from accompanying combat logistics force ships as required. Given the operational range and mobility of the fleet, they generally go to the advanced logistics support sites for partial replenishment rather than the logistics distribution system reaching out to wherever they are.

Due to the limited and sporadic amounts of resupply required by the fleet, the logistics delivery system is a very flexible pull process of ordering small items through reach-back. The fleet units use their mission equipment to pick up parts and supplies at local port storefronts when available. These unique conditions enable the hub-and-spoke system of delivery to work well.

Thus, the Navy does not normally require or use tactical logistics maritime lift given the ever present and embedded nature of the CLF and the mobility of the fleet units themselves. However, there are occasions when materiel needs to be transported from an ALSS to a RLS because the receiving ship has been directed to another location.

Navy inherent maritime logistics strengths

Now that we have examined the basic intertheater logistics needs of the COCOMs and each Service, we looked next at the inherent maritime logistics strengths of the Navy in order to leverage them to better support joint theater logistics.

Mobility and sovereignty

Probably the greatest maritime advantage is that of mobility and retention of sovereignty. Ocean-going logistics assets can move around and shift to wherever they are needed without limitations on their operations. While there are some potentially limiting sovereignty control points, such as the Suez and Panama canals, the majority of ocean logistics channels are open and unrestricted. This is also a strength when dealing with large capital supporting investments like fuel dispensing, power or water production plants. They can be relocated for use elsewhere and have a reduced risk of loss or damage. This maritime feature is also the reason that most pre-positioned materiel is staged afloat rather than on shore.

Autonomous and self-sufficient (staying power)

Along with the mobility and freedom of maneuver, maritime logistics assets have the range and independence to span the globe and remain on station for months at a time if necessary without extensive external support. This can be a very useful logistics force multiplier when the warfighting requirements are volatile and unpredictable and location of need could change.

Large logistics capacity

The next greatest strength is the large volume of materiel that maritime logistics vessels can carry. Although delivery is usually measured

in days rather than hours (as via airlift), the quantities and economies are orders of magnitude greater. While there is currently little excess capacity since the Navy has properly sized the CLF to support just Navy and expeditionary Marine Corps requirements, with planning and tasking the available capacity could be increased. It is this capacity feature along with the freedom to maneuver that makes the seabase operational concept feasible and attractive.

Built-in force protection

The large surface area of the oceans, along with constant force movement and ability to maintain large stand-off distances from potential enemies, provide a built-in force protection for maritime assets. Situation awareness of potential enemy forces is easier to develop and maintain on the broad and open ocean.

Robust theater missile defense

The Navy has developed a robust theater missile defense capability that can be extended to include protection of SPODs and other critical on-shore logistics support points. This along with close-in direct fires support could greatly enhance force protection for joint logistics assets.

Water production

Since maritime vessels are always in contact with saltwater, they produce their own potable water. This is a great advantage because water is one of the heaviest and most expensive consumables to transport. Ships normally do not have to limit their consumption of water or conserve it, unless they have equipment malfunctions.

Large refrigeration capacity

Another unique maritime logistics strength is the quantity of refrigerated storage spaces that vessels can haul around with them. The advantage is not only with size, but with mobility as well, since perishables can be taken to where they are needed. Although there is little

excess capacity at this time, with planning and tasking this capacity could be increased to leverage this maritime strength and better support joint operations.

Operate same in peacetime as in combat

One more operational strength of maritime logistics is that it is performed the same in terms of relative tempo and procedures as in wartime. In other words, the same procedures are used and it takes just as much fuel and personnel no matter the situation—an underway replenishment is conducted the same way in peacetime as in wartime. This allows personnel to become proficient in operations and delivery practices. If the scope of the conflict requires increased capacity, assets are drawn from the ready reserve along with commercial assets.

Global contracting and contracts management capability

Since the Navy's hub-and-spoke logistics system was build around resupply of perishables and spare parts anywhere in the world, there are numerous regional contracting and procurement offices located throughout the world. Local foreign procurement has been used to reduce the time and cost of providing certain supplies. This maritime contracting presence and expertise could be a major aid to joint logistics needs.

Now that we have identified some of the maritime logistics strengths of the Navy, we looked next at the organizational relationships between the joint command structures and the Navy command structures to better match the maritime strengths with needs. We selected the Pacific Combatant Command as the primary area to investigate since it has the most extensive maritime support requirements.

PACOM JTL organization

One of the purposes of this study is to ascertain where naval logistics practices and expertise can be a larger contributor to joint theater logistics efforts. The U.S. Pacific Command (PACOM) is in charge of all U.S. military forces in the Pacific and Indian Oceans. Its mission is [30]:

> "PACOM, in concert with other U.S. government agencies and regional military partners, promotes security and peaceful development in the Asia-Pacific region by deterring aggression, advancing regional security cooperation, responding to crises, and fighting to win."

As one of the joint commands, PACOM also is charged with directing, in its area of responsibility, and coordinating U.S. military forces in peacetime, times of crisis, and times of war. In addition, PACOM provides general security to promote a prosperous and democratic Asia-Pacific community.

The sheer size of the region under the responsibility of PACOM lends itself to logistics problems not encountered in other joint commands, particularly in the maritime domain. It is for this reason that we focused on PACOM as a case study of current naval logistics capabilities and how they now support joint operations.

Chain of command

PACOM is one of the unified commands and operationally reports directly to the Secretary of Defense. However, administratively, PACOM reports through the Chairman, Joint Chiefs of Staff. It has direct authority of forces assigned to the region through commanders of Service components, subordinate unified commands, and joint task forces. In times of crisis or war, it can request and task forces assigned to other regions of the world.

The total force structure operating within PACOM includes some 300,000 military personnel from the Navy, Marine Corps, Air Force, and Army. This represents approximately 20 percent of all active duty personnel in the armed forces. It is important to see how these personnel are represented across the structure as this facilitates understanding the possible contribution of naval logistics efforts to joint theater logistics.

U.S. Army Forces

- Headquarters, I Corps (Washington)
- 25th Infantry Division (Hawaii and Washington)
- U.S. Army Chemical Activity Pacific (Johnston Island— an atoll located 700 miles southwest of Honolulu)
- 172nd Infantry Brigade (Separate) (Alaska)
- 9th Regional Support Command (Hawaii)

Marine Forces Pacific

- I Marine Expeditionary Force (California)
- III Marine Expeditionary Force (Japan)

U.S. Navy Forces

- Third Fleet (California)
- Seventh Fleet (Japan)

U.S. Air Force

- Fifth Air Force (Japan)
- Seventh Air Force (Korea)
- Eleventh Air Force (Alaska)
- Thirteenth Air Force (Guam)

Subordinate unified commands

- U.S. Forces, Japan (Yokota Air Base)
- U.S. Forces, Korea (Yongsan Army Garrison)
- Eighth U.S. Army, Korea (Yongsan Army Garrison)
- Special Operations Command Pacific (Hawaii)
- Alaskan Command (Alaska)

Standing Joint Task Forces

- Joint Interagency Task Force West (California)
- Joint Prisoner of War/Missing in Action Accounting Command (Hawaii)
- Joint Task Force 519 (Hawaii)

Additional supporting units

- Asia-Pacific Center for Security Studies (Hawaii)
- Joint Intelligence Center Pacific (Hawaii)
- Center of Excellence in Disaster Management & Humanitarian Assistance Studies (Hawaii)

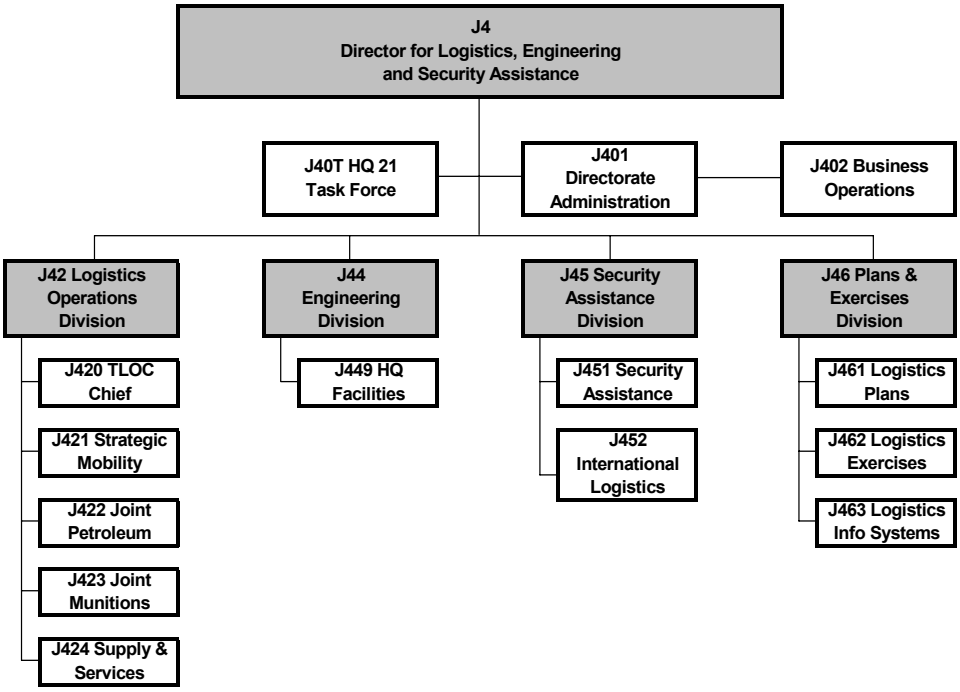
Clearly, the forces residing within the PACOM region are numerous and widely scattered. Note the great distances separating the different military installations in PACOM's area of responsibility. Given the geographical structure of PACOM and the dispersion of U.S. military forces, if the naval logistics policies and procedures are going to play a central role, it will be here. Hence, PACOM represents the best region to study how the Navy might lend support to joint theater logistics efforts.

J4 logistics organization

The structure of J4 within PACOM is similar to the J4 structure within the Joint Chiefs of Staff. The head of J4 for PACOM has the title

Director for Logistics, Engineering, and Security Assistance [31]. Figure 8 shows the current organizational chart.

Figure 8. U.S. Pacific Command J4 organization chart



The J4 Director reports directly to and supports the Commander, PACOM, in all areas of logistics. The divisions reporting to the director of J4 are fairly common to logistics organizations within the Department of Defense. The petroleum and the strategic mobility offices within PACOM J4 are structured somewhat differently due to having more difficult issues to overcome. This results from the large surface area covered by PACOM and especially because sources of petroleum products need to be procured at several different widely separated locations. The great distances between population centers and greater proportion of ocean surface to land mass result in long supply lines. PACOM also has large areas in which to maintain

situational awareness and provide force and commerce protection. The “tyranny of distance” will always be a key driver for operational considerations within PACOM.

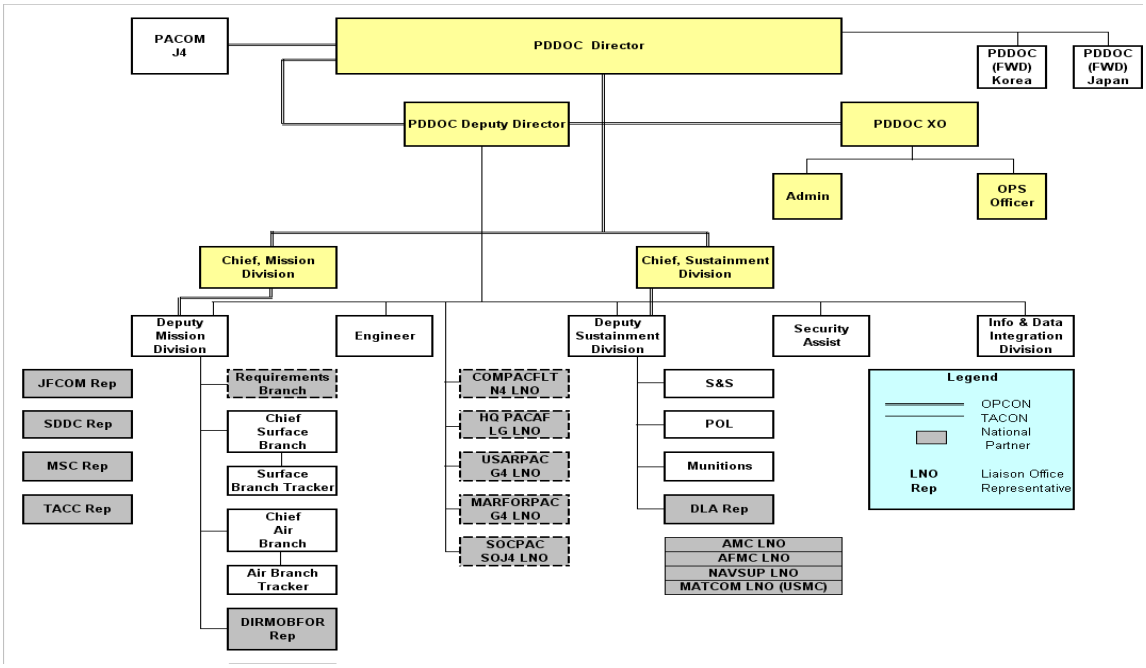
JDDOC structure

Within each of the unified commands is a Joint Deployment and Distribution Operations Center (JDDOC). The JDDOC is assigned the following tasks [32]:

- Execute the combatant commander's priorities and policies
- Create integrated information technology systems
- Create joint logistics effects in theaters
- Synchronize inter- and intratheater lift
- Act as the critical link between USTRANSCOM and national partners.

These tasks are common to all the unified commands although the implementation practices and priorities are different within each of the unified commands. With respect to PACOM, the role of the JDDOC is especially critical. An organizational chart depicting the command and control relationships of the PACOM Deployment and Distribution Operations Center (PDDOC) located in Camp Smith, Hawaii is shown in figure 9.

Figure 9. PACOM DDOC organization chart



The organization was first established on 1 January 2005 and has since added forward detachments of the PDDOC[12] in Camp Oscar in Korea and the Yokosuka Naval Base in Japan. The PDDOC mission statement is as follows: "Synchronizes and optimizes strategic and theater resources to maximize distribution, force movement and sustainment in support of the COCOM's vision [33]."

It is imperative that logistics operations be efficient as possible in order to accommodate for the fact that since PACOM operates in such a large area, mistakes in logistics efforts, such as ordering and delivering supplies (especially large-ticket items), are magnified. In

12. PDDOC-Korea was established in March 2005 and PDDOC-Japan was created later in December 2005.

addition, problems resulting from errors in stocking incorrect stores and supplies are also magnified. For these reasons it becomes more important to model, through statistical demand forecasting techniques, the total needs for the forces in theater by item where possible or by aggregated needs.

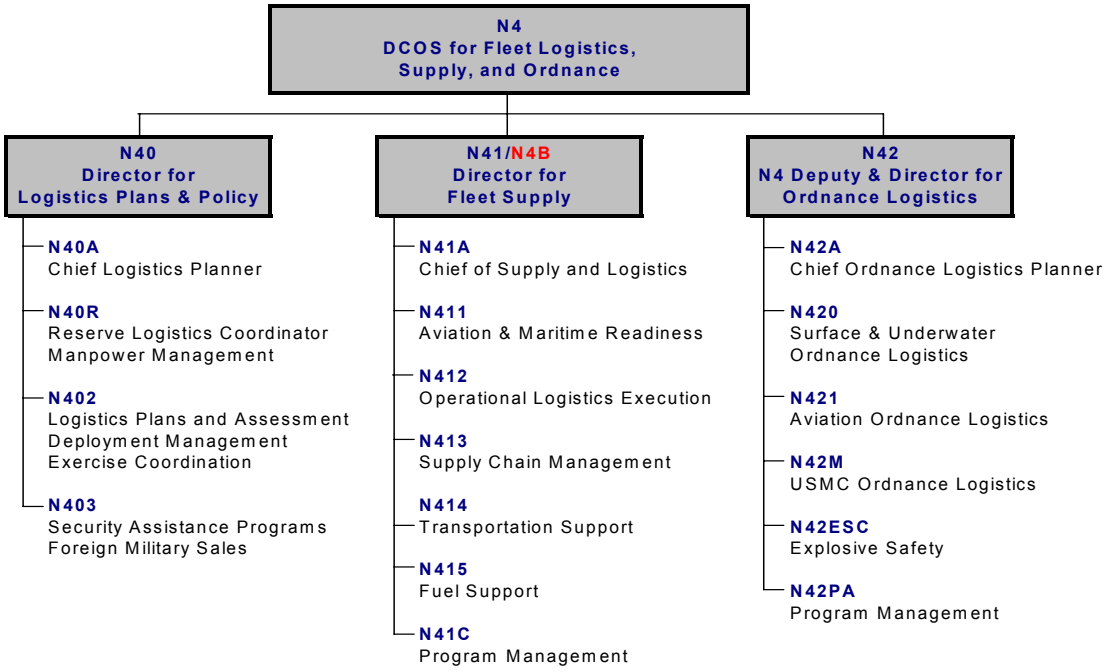
The Defense Logistics Agency maintains forward depots at Guam, Japan, and Korea. However, there are many countries within PACOM that are significant foreign suppliers to U.S. forces. Hence, a good deal of logistics operations within PACOM are intratheater rather than intertheater.

The Navy logistics capabilities can play a more central role. The Navy owns and operates the maritime transportation assets capable of transporting the required supplies across PACOM. All of the tasks listed above that are assigned to the JDDOCs have a direct relationship with Navy assets. What is needed is a synchronization of emerging technologies (such as Radio Frequency Identifier (RFI) smart shipping boxes, joint intratheater high-speed sealift, ship-to-ship and ship-to-shore cargo interfaces), and state-of-the-art statistical forecasting and operations research models that provide the process manager with a decision-making edge.

Pacific Fleet N4 logistics organization

The structure of the Commander, Pacific Fleet (COMPACFLT) N4 group is similar to other fleet organizations. The head of N4 is the Deputy Chief of Staff for Logistics, Fleet Supply and Ordnance. There are three divisions within the organization: Director, Logistics Plans and Policies (N40); Director, Fleet Supply (N41); and Director, Fleet Ordnance (N42). Figure 10 shows the current organizational chart [34].

Figure 10. Commander, Pacific Fleet N4 organization chart



The Director for Logistic Plans and Policy (Code N40) is the principal N4 Liaison with PACOM J4 and is responsible for deliberate and contingency planning for OPLAN Annex D - Logistics and Annex P - Host Nation Support. This branch also coordinates force flow development in support of PACOM and CENTCOM, exercise planning, and crisis action response. In addition, this code manages force flow, security assistance programs, and logistics readiness measuring and reporting.

The Director for Fleet Supply (Code N41) manages the support strategy for PACOM AOR Supply and assists with the OPLAN/CONPLAN Annex development. This includes supply chain management, combat logistics force, maritime and aviation readiness, operational

logistics execution, transportation support, fleet service support, fuel support, and the flying hour and steaming day programs.

The Director for Ordnance Logistics (Code N42) advises PACOM on ordnance planning, re-supply, and distribution matters. The group also manages the ordnance supply chain and provides oversight on all ordnance handling and operations issues within the theater.

The current COMPACFLT logistics goals are to maintain an operational focus by:

- Recognizing the hot spots requiring logistics combat capability
- Partner with Naval Supply Systems Command (NAVSUP), Naval Operational Logistics Support Center (NOLSC), and DLA to improve joint support
- Align logistics support to Operations Plans (OPLANs), Contingency Plans (CONPLANs), Global War on Terrorism (GWOT), Maritime War on Terrorism (MWOT), and Maritime Homeland Defense (MHLD)
- Push logistics support west

They are emphasizing forward strategic stock positioning by working with NAVSUP and DLA. Finally, they are supporting Commander, Fleet Forces Command (CFFC) and NAVSUP's lead to implement Distance Support[13] (DS) and gain efficiencies for the Navy [34].

In general, it appears that coordination is being accomplished between PACOM J4 and COMPACFLT N4 staffs for planning and contingency operations but to a lessor extent for day-to-day supply logistics coordination. Although there is normally not a need for extensive coordination, we found that lessons learned from review of the recent Operation United Assistance experience point to the possibility of improvements in coordination among the staffs.

13. Distance support is a program to provide the Fleet with collaborative infrastructure support that leverages both Navy and Industry resources to improve readiness, reduce workload afloat, and improves the Sailors' quality of service.

Specifically, maintaining the maritime operations branch under a combined surface operations branch within the PACOM JDDOC organization runs the risk of maritime capabilities, risks, and operational constraints not getting sufficient visibility within the COCOM structure. Particularly for PACOM which has to operate largely in a maritime dominated AOR domain.

In comparing the two organizational structures, there are two major differences which stand out. PACOM as the combatant commander has a designated strategic mobility officer while the PACFLT logistics structure does not identify this as a focus area. Unit movement planning and execution as pointed out before are particularly important for PACOM due to the large operating area. In order to better integrate Naval logistics practices, this area should be given more visibility within the N4 staff to coordinate more closely with the COCOM strategic mobility officer. The Navy's Commander, Fleet Forces Command (CFFC) should examine how all the fleet staffs are coordinating with the COCOM strategic mobility officers as joint operations make this role more significant than in previous years.

The other major difference is the presence of an engineering division within the PACOM J4 and the total absence from the PACFLT N4 staff. This is reflective of the overall Navy practice of segmenting fleet engineering and facilities management away from the overall logistics program. Although this function is provided by another portion of the PACFLT staff, it requires the combatant command staff to deal with another organization and coordination could be improved through consolidation. The Navy should review its current organizational segmentation of logistics and determine if improvements could be obtained by consolidation.

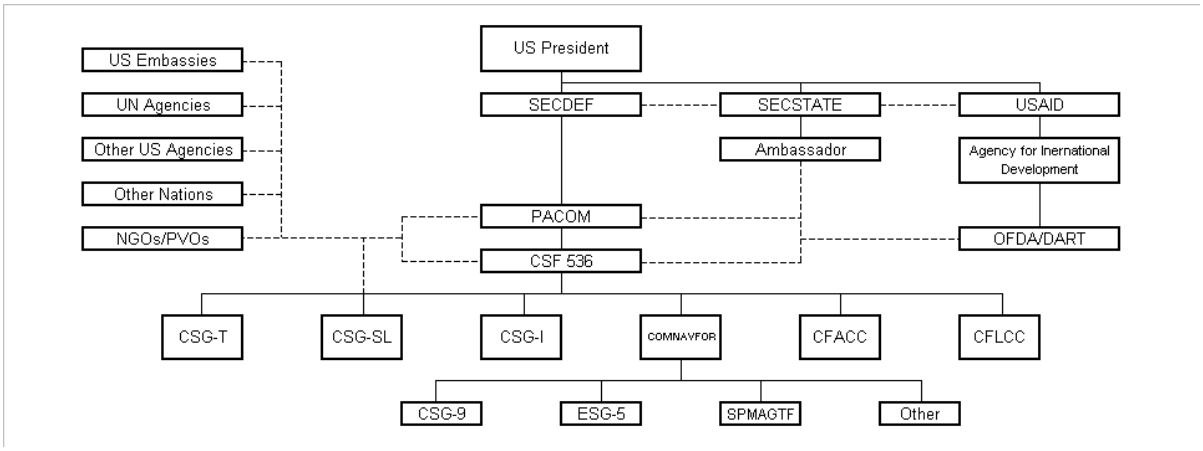
The Navy could also improve the support it provides to joint theater logistics by expanding the roles of regional contracting offices to support other Services and by partnering with the other Services to standardize logistics tracking, labeling, and packaging systems. While the gains in joint theater logistics support capability resulting from better integration of the COCOM and fleet staffs would not be huge, they could still help the process for relatively little investment cost.

Humanitarian Assistance (HA) support for tsunami victims

The undersea earthquake and resulting tsunami that occurred in the eastern Indian Ocean on 26 December 2004 was one of the greatest natural disasters of modern times. This section presents a brief discussion of the assets each Service branch provided to the joint task force, in terms of logistics support for Operation Unified Assistance (OUA). In essence, all assets provided for tsunami relief dealt with logistical issues in one manner or another.

OUA was the military support to the U.S. relief efforts. The military's role was to provide assistance to the governments of Indonesia, Sri Lanka, Thailand and other affected nations in order to minimize the loss of life and mitigate human suffering. Commander, U.S. Pacific Command activated Combined Support Force (CSF) 536 on 28 December 2004 with LtGen Robert Blackman, USMC, commanding and deployed it to Thailand to coordinate military assistance to the U.S. foreign disaster relief effort. Figure 11 provides the U.S. disaster relief command structure with interagency interactions included [35].

Figure 11. U.S. Indian Ocean tsunami disaster relief command structure



CSF 536 established Combined Support Groups (CSGs) in Thailand (T), Sri Lanka (SL), and Indonesia (I) to coordinate in-country support. These commands had no forces assigned to them as the logistics and operational support flowed through a joint force-like structure consisting of Commander, Naval Forces (COMNAVFOR), Combined Force Air Component Commander (CFACC), and Combined Force Land Component Commander (CFLCC). RADM William Crowder, USN, commanded the naval forces, was also the Carrier Strike Group 9 (CSG-9) commander, and became the CSG-I commander as well. The maritime support consisted of four groups of assets: CSG-9, Expeditionary Strike Group 5 (ESG-5), Special Purpose Marine Air-Ground Task Force (SPMAGTF), and other supporting units.

Given the logistics assets provided by each Service element under the USPACOM joint force structure, we related those assets to how the Navy might play a greater role in supporting them in a joint humanitarian assistance role.

Army logistics support

The initial response from the U.S. Army included four mortuary affairs teams to provide assistance in identifying, evacuating, and processing the deceased. The Navy could lend additional support to this type of operation by providing helicopter assets for transporting the remains to central morgues for further processing and providing refrigerated, climate controlled spaces for temporary holding areas.

The 8th U.S. Army, stationed in Korea, deployed medical and logistics units along with CH-47 Chinook helicopters. These organizations provided medical support along with assistance in distributing supplies via the heavy-lift helicopter assets. The maritime element could use its own organic vertical lift capacity to support these helicopter operations, and provide a source for refueling. Since the Navy does not own or operate CH-47 helicopters, they could lend little assistance to the Army for maintenance and spare parts support.

The U.S. Army Corps of Engineers deployed three Forward Engineering Support Teams to the region. Each of these teams included a single military team leader, a civil engineer, a structural engineer, a geo-technical engineer, and two electric power generation engineers. These teams were tasked with assessing the local infrastructure and also assisted in planning reconstruction efforts with the host nation. The Navy could provide local airlift to transport these teams from site to site. The maritime element could have provided the same type of disaster relief engineering support by utilizing Construction Battalion detachments to assist in damage assessment, road reconstruction, and cleanup operations.

The U.S. Army Special Operations Command deployed three civil affairs teams and one psychological assessment team to the region. The civil affairs teams assisted in coordinating relief efforts, while the psychological assessment team focused on distributing information about non-governmental organization (NGO) relief support in the area. The psychological assessment team possessed the audio broadcasting capabilities required to perform this work. Other than transportation, berthing, and messing support, the additional possible maritime logistics support to this group would be limited [36]

although graphics design, language support, and reproduction support as well as command, control, communications, computers, and intelligence support could also have been provided.

Air Force logistics support

The U.S. Air Force committed the following logistical airlift assets to the tsunami relief effort: 7 C-130 cargo aircraft, 10 HH-60 helicopters to be used for cargo vertical lift transportation, 10 HH-60 helicopters to be used for medical evacuations, and both C-5 Galaxy and C-17 Globemaster heavy-lift cargo transports. These aircraft flew multiple missions during relief efforts carrying communications equipment and medical supplies [37].

USMC logistics support

The U.S. Marine Corps initially provided 6 CH-53D Sea Stallion helicopters to the region. These helicopters were airlifted into the theater via C-5 Galaxy cargo aircraft that are operated by the U.S. Air Force Air Mobility Command and scheduled by USTRANSCOM. Additional heavy-lift helicopters were also sent into the region.

A single high-speed, roll-on/roll-off transport vessel, MV *Westpac Express*, was deployed to the region. This ship is a leased vessel[14] that is part of the Military Sealift Command's pre-positioning program chartered for Marine Corps use in the western Pacific and normally supports the III Marine Expeditionary Force based in Sasebo, Japan.

The Marines also supplied 4 C-130 medium-lift cargo aircraft to deliver relief personnel, and supplies, and to conduct medical evacuations. The 3rd Marine Aircraft Wing from Marine Corps Air Station, Miramar, California, was also deployed to the region. To support this wing, KC-130s which are aerial tanker variants of the C-130, were also deployed to the region. Finally the Marines sent the 9th Communica-

14. This high-speed diesel-powered, water jet catamaran vessel is 331 feet long and provides 32,000 square feed of deck space for cargo transportation. It can exceed 40 knots and is capable of transporting 970 personnel with 305 tons of equipment and supplies.

tions Battalion to the region. This unit is based out of Camp Pendleton, California, and was deployed to provide ground-based communications support [38].

The number of Marine personnel and equipment sent from outside the region, in terms of personnel and tonnage, was not very significant. However, the personnel skill sets and type of equipment sent were very task-oriented to the job, which increased their usefulness to the task force commander. Note that the destruction that resulted from the disaster was generally limited to the littoral area which enhances the utility of maritime logistics support and Marine expeditionary capabilities. The most important aspect of providing logistics support to relief efforts occurred in transporting supplies from the maritime supply vessels to the shore.

Navy logistics support

In terms of tonnage and the volume of relief effort provided to the people affected by the tsunami disaster, the Navy had the most significant impact on the overall joint task force relief effort provided by the United States. In this particular instance, the nature of the natural disaster resulted in the majority of the damage and devastation being within a few miles of the shoreline. This resulted in the Navy being the prime mover of relief supplies because it played into the several strengths of maritime logistics. The majority of consumable supplies delivered to tsunami victims were transported by the Navy from support ships mostly operated by the Military Sealift Command. The Navy deployed numerous vessels to support the relief efforts. Table 8 summarizes the group assets used in OUA Indonesia [35].

Table 8. Maritime support assets used in OUA Indonesia disaster relief

Asset	CSG-9	ESG-3	SPMAGTF	MPSRON-3	CLF-76
Fleet vessels	USS *Abraham Lincoln* (CVN 72)	USS *Bonhomme Richard* (LHD 6)	USS *Essex* (LHD 2)	MV *CPL Louis J. Hague, Jr.* (TAK 3000)	USNS *Niagara Falls* (TAFS 3)
	USS *Shiloh* (CG 67)	USS *Rushmore* (LSD 47)	USS *Fort McHenry* (LSD 43)	MV *PFC James Anderson Jr.* (TAK 3002)	USNS *Concord* (TAFS 5)

Table 8. Maritime support assets used in OUA Indonesia disaster relief (continued)

Asset	CSG-9	ESG-3	SPMAGTF	MPSRON-3	CLF-76
	USS *Benfold* (DDG 65)	USS *Duluth* (LPD 6)[a]		MV *1st Lt Alex Bonneyman* (TAK 3003)	USNS *San Jose* (TAFS 7)
	USS *Shoup* (DDG86)	USS *Bunker Hill* (CG 52)		SS *Maj Stephen W. Pless* (TAK 3007)	USNS *Tippecanoe* (TAO 199)
	USNS *Rainer* (TAOE 7)	USS *Milius* (DDG 69)		MV *1st Lt Jack Lummus* (TAK 3011)	
		USS *Thatch* (FFG 43)		USNS *1st Lt Harry L. Martin* (TAK 3015)	
		USCGS *Munro* (WHEC 724)		USNS *Watson* (TAKR 310)	
Lift assets					
LCAC	0	4	2	0	0
C-2	2	0	0	0	0
H-60	16	6	4	0	0
H-46	2	12	8	0	0
H-53	0	4	4	0	0
UH-1	0	3	0	0	0

a. USS Duluth detached for relief operations in Sri Lanka.

In addition to the above assets, the Navy also provided P-3C Orion patrol aircraft imagery of the disaster areas, USNS *Mercy* sea based medical support, and hydrographic surveys of the Sumatra coast. The Navy sent 25 ships to the region to support disaster relief operations. These included 7 maritime pre-positioning ships operated by MSC. Two of those ships were primarily involved with providing fresh drinking water to the Republic of Maldives. Normally these ships are loaded with the necessary supplies to support Marine Corps expeditionary operations ashore. These supplies include food, fuel, medical supplies, road building equipment, and electrical generators. In addition to the pre-positioning ships, the Navy sent 4 fleet underway replenishment ships to augment the one supporting CSG-9. These vessels normally travel with fleet strike groups with their mission being to resupply the combatant ships with food, fuel, and other stores. They included 2 combat stores ships and an oiler. The combat

stores ships provide both food and fuel to the fleet units, whereas the oiler only delivers fuel. The amphibious ships are configured for ship-to-shore movement of Marines and equipment and can move large loads quickly ashore. This can be seen in table 9 which summaries the quantity of relief supplies delivered by CSG-9, ESG-5, and SPMAGTF. In total, these three groups delivered about 5.7 million pounds of supplies over 41 days (1 January through 10 February 2005). Both ESG-5 and SPMAGTF delivered relief supplies through a combination of air and LCAC surface lift, with about 50 percent delivered by LCAC for ESG-5 and about 40 percent for SPMAGTF [35].

Table 9. Strike group delivered relief supplies in Indonesia

		CSG-9	ESG-5	SPMAGTF
Days of relief operations		35	11	24
Lbs of relief supplies	Airlifted	2,235,185	680,119	1,277,732
	LCAC delivered	N/A	723,650	802,999
	Total	2,235,185	1,403,769	2,080,731
Delivery rate	Lbs/day	64,000	130,000	87,000
Sorties (flight hrs)	LCAC	N/A	14	24
	C-2	177 (463)	N/A	N/A
	H-60	868 (2,719)	104 (116)	148 (196)
	H-46	47 (72)	139 (130)	127 (291)
	H-53	N/A	34 (44)	57 (162)
	UH-1	N/A	2 (1)	N/A

The U.S. armed forces provided critical support to the international tsunami humanitarian assistance relief efforts. The Navy, in particular, provided the on-scene command and control support as well as the vast majority of disaster relief supplies transported to the worst-hit Indonesian region.

There are several lessons learned from this operation that can apply to maritime support in future disasters. We see the Navy playing a pivotal role for additional tsunamis/earthquakes along the Pacific "Rim of Fire," and hurricane or typhoon disaster relief support around the world. In humanitarian assistance operations, conservation of time and quickness of response is critical as hours equals lives. The forward

nature of maritime forces and freedom of maneuver add greatly to the ability to deliver relief supplies where and when needed. Diversion of in-theater pre-positioned military stocks works particularly well in meeting this need. Both air and sea strategic logistics distribution channels were limited in their usefulness due to throughput capacity limits and the lack of suitable APODs and SPODs near the disaster areas. This type of operation lends itself to an over-the-shore expeditionary approach which most closely matches the ESG maritime capabilities. The Navy could best support this type of operation in the future by acquiring additional HSVs and utilizing them to move existing pre-positioned and existing supplies within the COCOM area of responsibility.

It is less clear what the Navy can do to provide joint logistics support for natural disasters occurring more than 500 miles inland. In particular, significant inland earthquake events have occurred deep within the South Asia, China, and South American land masses. The Navy can provide lift capabilities to the shore, but will have difficulty in providing significant amounts of relief support deep into the interior.

Current joint support opportunities

How can maritime logistics support for joint theater operations be improved? We first looked at those actions that can improve JTL support today and can be accomplished in the short-term through policy, procedures, or structure changes. We point out that the following actions are options for the Navy to consider rather than formal recommendations. Since the Navy does not currently have significant logistics shortfalls within its own operations, the degree to which the Navy seeks to assume a greater role within JTL support is a value proposition which depends upon the assignment of joint maritime requirements and tasking. Therefore, we identified areas in which the Navy could become a more significant JTL player, but did not address the mission value question.

Fleet N4 alignment with J4 structure

As noted earlier in the paper, there is very little day-to-day overlap between the PACOM J4 organization located at Camp H. M. Smith, Hawaii, and the PACFLT N4 group which is located at Naval Station, Pearl Harbor, Hawaii. It would not be necessary to add additional billets as much as assigning existing Navy positions responsibilities in both organizations in order to improve communication and coordination so that critical emergencies can be managed better. In particular, the maritime cell within the JDDOC surface operations branch should have at least one dual-hatted naval officer embedded within it to ensure that the full maritime logistics capabilities of the Navy are utilized. In addition we recommend that the Navy request that the surface operations branch in the standard JDDOC organization be split into separate land and maritime branches (or as a minimum provide it as an option for the COCOM). As OUA showed, maritime operations in PACOM are much more demanding and valuable than in CENTCOM, where the tactical maritime support is not as significant. In addition, we recommended review of the fleet staff structure

to better align the strategic mobility and fleet engineer functions with the COCOM.

MSC alignment with fleet operations

In January 2006, it was announced that Military Sealift Command Far East in Yokohama, Japan, would be disestablished in July 2006 and relocated to Singapore as the new Sealift Logistics Command Far East [39]. The stated chief goal of the move was to collocate with Commander, Task Force 73 (CTF-73)—the operational commander for MSC logistics force ships operating in the U.S. 7th Fleet area of responsibility. Prior to this move, the two commands were 3,288 miles apart.

Although the collocation will certainly improve the efficiency of operations, it would seem reasonable to take the next step and place the separate commands under the same commander. This has already been accomplished in Europe with Sealift Logistics Command Europe and Commander, Task Force 63 both reporting to the same senior [40]. Given the close working relationship between the two organizations, sharing the same commander will ensure better working relationships and communications, as well as free up an additional military command billet.

Potable water production

Potable water production within theater is critical not only for combat and security operations but for humanitarian assistance as well. DOD planning for potable water consumption is 20 gallons per individual per day, with 3.9 to 7.7 gallons used for drinking, personal hygiene, field feeding, and treatment for heat injury. Water weighs 8.34 pounds per gallon [26]. Therefore, a battle force of 8,000 soldiers requires more than 160,000 gallons per day, weighing at least 667 tons. Even for a short 2-week period, the total amount of potable water that would have to be produced, packaged, transported, and distributed exceeds 9,300 tons of materiel. This is a significant logistics burden that the Army, Air Force, and Marine Corps must accommodate in the field.

If local source water is within tolerance, Reverse Osmosis Water Purification Units (ROWPUs) can be set up with collapsible water collection tanks. The 3,000 gallons per hour (GPH) ROWPU and 600 GPH ROWPU units are the primary water purification workhorses in today's military water units. Marine Corps deployable water assets, for example, are part of an Engineer Utilities Platoon. The platoon consists of four military occupation specialties: Hygiene Equipment Operator, Basic Electrician, Electrical Equipment Repairman, and Refrigeration Repairman. The Marine water specialists also operate laundry, shower, and water equipment. The Marine water equipment consists of 600 GPH ROWPUs (skid-mounted with separate 30 kilowatt tactical quiet generators) [41]. Most water is stored and transported in collapsible 3,000 gallon "onion-skin" water tanks. Other methods of distribution include hard-walled tankers and semi-trailer mounted fabric tanks (SMFTs). The optimum temperature for water purification with reverse osmosis is 77 degrees Fahrenheit. As the temperature of the source water drops below this, production rates decrease because increased water molecule cohesion. This cohesion decreases the amount of water that passes through the ROWPU's reverse osmosis membranes.[15]

The maritime logistics strengths can greatly help the joint force water production problem. Since ships produce their own potable water while at sea, in temperature controlled conditions, and can store large quantities of fresh water in most cases, the introduction of individual packaging equipment and bulk transporting containers would allow the maritime force to generate fresh water for joint forces ashore as well. Note that the transfer of water from the maritime force to the shore has the same mass-time-capacity issues as other materiel being transported and better methods of transfer need to be developed.

15. Source: *Special Report 86-20 Field Water Supply on the Winter Battlefield*, US Army Cold Regions Research and Engineering Laboratory, 1986

Maritime logistics force protection doctrine

Many of the logistics support assumptions are based on operating within a benign rear support area threat environment. While that has been a reasonable planning factor in the past, as noted earlier, our logistics experience in Iraq has showed that minimal hostile forces at land or sea can seriously disrupt logistics support. The Navy has considerable capability with offshore anti-missile and direct fire support. The Navy can add considerable force protection support to the joint force by protecting SPODs and APODs (if close to the littoral). These maritime contributions should be studied so that, if the need arises, they can be implemented quickly and effectively.

Regional contracting office support

One of the major strengths of the Navy is the worldwide distribution of contracting and resupply offices. Using just the Western Pacific region as an example, the Navy has a Navy Regional Contracting Center (NRCC) located in Singapore, with detachments in Sydney, Jakarta, Manila, and Hong Kong. Fleet Industrial Supply Center (FISC) Yokosuka also provides contracting services with detachments in Sasabo and Okinawa. These are assets that could be readily utilized to support the joint force contracting requirements within each of the COCOM theaters.

By comparing these actions to the JTL critical capabilities found in table 7, the greatest support would be gained in the respond and collaborate categories of capabilities. In particular, the areas of synchronizing inter- and intratheater deployment and distribution, joint subsistence and water management, joint theater contracting and contracts management, and COCOMs/JTFs/Service components coordination would be improved.

How would these short-term actions help with the JTL issues identified earlier? Table 10 shows the issues that could be improved as a result of taking these steps.

Table 10. Summary of current joint support opportunities influence on maritime JTL issues

	Maritime JTL issues					
Current joint support opportunities	Service responsibility	COCOM responsibility	JDDOC maritime support	Peacetime / wartime structure	Maritime common lift	Logistics force protection
N4 & J4 alignment	X	X	X	X		
MSC & fleet alignment				X		
Potable water						X
SPOD force protection						X
Regional contracting			X	X		

Note that developing a closer day-to-day working relationship between the COCOM J4 staff and the fleet N4 staff would have the greatest effect upon the JTL issues that were identified earlier. Each of these actions helps improve one or more of the concern areas.

The above actions should be examined by the Navy as to their reasonableness for implementation. None require extensive platform capital investments, and the long-term benefits for joint theater operations could be significant.

Future joint support opportunities

Next, we looked at those actions that can improve JTL support in the future and can be accomplished via longer-term actions through additional capital investments. The Navy has many opportunities to participate in joint logistic support functions. And, if the concept of using a sea base for future military operations becomes a reality, the Navy will play the central role in the success of this operation. While not addressed specifically in this study, the command and control aspects of JTL are another opportunity for the Navy to become better integrated into the overall joint structure. Total asset visibility of materiel and compatible information management systems to allow total information sharing will be critical to future joint operations. These initiatives are ongoing and the Navy should continue to support and participate in them.

There are four areas where we see the Navy providing a strong supporting role on joint logistics operations: High Speed Vessels (HSV), sea base support, amphibious sea plane development and operation, and logistics maritime force protection.

High Speed Vessels

The concept of developing and using HSVs for logistics operations is not new. In many military operations speed is of the essence. Also, the current design under consideration, namely the catamaran, has been around for centuries. It is well-known that a catamaran will slice through, rather than go over, wave patterns. This design has been used for many years in commercial operations but only recently has the U.S. military become significantly interested in vessels with the catamaran design. The reason for this recent interest is that this particular design has the capacity to haul from 400 to 600 short tons of cargo and troops at 40 knots. The vessel under consideration has a fully loaded range of 4,500 nautical miles. This permits the vessel to

traverse most ocean crossings without replenishment. With this capacity, the U.S. could rapidly reposition brigade-size forces in theatre. However, the living conditions for embarked troops is austere and probably not suitable for longer duration personnel movements.

Additional capabilities associated with the vessel are currently under consideration. The vessel offers a great capability to provide significant assistance in humanitarian efforts. Even when fully loaded, the HSV still has a very shallow draft—12 to 14 feet. Depending on the underwater topography, this permits it to travel reasonably close to the shore, and certainly allows it to moor at any pier in order to off load supplies to disaster victims.

Another advantage is that the catamaran design for this HSV is currently in use in commercial operations. Thus, most of the research and development work has already been completed, so, the cost to obtain these vessels is less than for a new design. The current estimated acquisition cost falls between $70 million and $100 million[16] for the baseline military vessel [42]. The basic design includes helicopter landing pads, aircraft/cargo elevators, extensive command and control capabilities, vehicle ramps for roll-on and roll-off functions, and weapons modules. This leads to an extremely versatile ship that can perform a wide range of missions for the Navy.

In conclusion, the HSV offers a very capable platform for moving cargo and troops in littoral areas and could also allow the Navy to be a major player in joint theater logistics. Currently, the major value seen with the Joint High Speed Vessel (JHSV) is the capability to move large amounts of equipment and associated personnel operational distances quickly through the maritime environment. This new ability eliminates much of the integration issues resulting when airlifted units need to marry up with their equipment and ready supplies upon de-embarkation. This is particularly attractive to the Army which envisions using these vessels in groups in order to maintain unit cohesion up through brigade levels. In addition, with appropri-

16. This estimate maybe growing as recent program references now put the cost at $210 million for the lead ship and $170 million for follow-on vessels.

ate modifications, the HSV could also be a major asset in force protection and small joint battle force command and control. Given the speed of the vessel, it could certainly outrun most adversaries. Presently, the Navy has plans to add four of these ships to the fleet and the Army has plans for six of these ships. Both Services should strongly consider crewing these HSVs with civilian mariners who work within the Military Sealift Command. The mariners would operate the ship while Navy and Army personnel would support operational requirements. The mariners would all be subject to common training and could therefore serve aboard any Army or Navy ship. This commonality of training provides for a better and more productive work force.

Sea base development

The proposal to conduct entire military operations from a sea base has become increasingly popular in recent years. It became more than a conceptual issue in 2003 when Turkey, a longtime ally of the United States, refused to allow U.S. military forces entry into Iraq from Turkish soil. While the sea base will never be able to replace the existing strategic logistics airlift and sealift of material to the land distribution systems due to the large volume requirements, it can be a very effective and timely augment of critical supplies when most needed.

The sea base concept eliminates, to some extent, the requirement of establishing an "iron mountain" of military supplies after an initial shore assault. The sea base, if operated properly, eliminates the need for creating this mountain of supplies on shore. When operating from a sea base the difficult task is transporting the troops and supplies from the sea base, in the volumes required, to the point of tactical need. In other words, there must be an efficient, reliable procedure for transporting materiel from the sea base to the foxhole. Note that the sea base will be the central point of military operations for the Army along with the Navy and Marine Corps. This is the key characteristic of the sea base [43].

The sea base has five main operational advantages:

- Primacy of the sea base - over the horizon, reduced or eliminated footprint
- Reduced demand - sea base support, technology improvement, lighter force ashore
- In-stride sustainment - network-based, automated logistics for maneuver units
- Adaptive response and joint operations - expanded missions, joint support
- Force closure and reconstitution at sea - building and restoring combat power

Given these advantages, the sea base offers the most promising area for the Navy to be a major player in joint logistics operations and support. In fact, one could argue that, by default, the Navy must be the major player in the success of the sea base.

Along with robust joint logistics over the shore (JLOTS) capability, the "air bridge" is the fundamental key to the success of operating from a sea base. Along with the air bridge and JLOTS, another key to the sea base is the Maritime Prepositioning Force (MPF). The MPF consists of a set of ships that contain all the necessary supplies for initial military operations. Subsequently, after the formation of the sea base and commencement of support operations, the sea base must be reconstituted. Obviously, the only way to do this is from the sea. The Navy, and in particular the Military Sealift Command, will be responsible for reconstituting the sea base.

The Navy is very adept at resupplying itself at sea, but the sea base will require the military, and in particular the Navy, to develop additional materiel handling/transferring capabilities to handle the extensive volume of supplies arriving in theater. The Navy must determine methods to transfer this volume of materiel in an efficient manner. Loading and unloading operations are critical. The major issue is how all of these supplies will be transported to support deep interior shore operations and that need is how the amphibious seaplane becomes a critical element.

Amphibious seaplanes

As mentioned in the previous section, transferring materiel and supplies from the sea base to forward operating locations is the critical factor in the success of the sea base concept. While both the Navy and Army have invested in JLOTS vessels and equipment, they require the use of shore support transfer facilities and port infrastructure. This works well for combat operations conducted within a 100 or so miles from shore or where well-established land shipment distribution channels exist. In many instances, these forward operating locations can now be up to 1,000 or more miles inland from the sea. The amphibious seaplane is could be a primary means for transferring a large amount of materiel that far inland from the sea base. Helicopters simply do not have the range or the lift capability to perform this mission. In line with the Army's new distribution doctrine, the seaplane also bypasses the force protection issues that plague truck convoys. Truck convoys hauling materiel and supplies from the sea to the tactical theater are susceptible, as has been evident in Iraq, to ground attacks. Protecting these truck convoys requires considerable resources that could be used better elsewhere. The seaplane does much to mitigate this risk for those supplies provided by the sea base. The additional amphibious capability enables the seaplanes to build a logistics bridge from the sea base to an APOD or FOL and insert the materiel into the existing Army, Marine Corps, and/or Air Force logistics distribution networks. In addition, an amphibious seaplane airlift bridge between Navy ALSS or FLS points and the sea base will allow for a resupply capability for the fleet which is currently not available.

Seaplanes have been in operation for many years and it has become apparent that the success of the sea base may very well depend on the development of a heavy-lift amphibious seaplane. The technology for amphibious seaplanes is not new and a few commercial equivalents are already flying, reducing the development time and acquisition risk considerably. The Defense Science Board [44] identified 12 issues that must be addressed to make the Sea Base function properly. In particular, they stated,

> "Among the issues on the list, three stand out as especially important that must be developed …2) a heavy-lift aircraft (> 20 tons) with theater wide range that can be based at sea."

As they further stated,

> "The bottom line: future heavy-lift aircraft must be capable of operating in austere environments and from the Sea Base."

Each seaplane currently available operates with the obvious relationship of payload and range—the larger the payload the shorter the range. In addition, the seaplane must possess other requirements in order to support the sea base. The seaplane must be capable of being moored and docked at more than one type of ship. If the Navy is to be a major player in joint theater logistics, then it must adapt its ships, in particular MSC and MPF(F) ships, to handle payload transfer issues with the seaplane. If the ships are not adaptable to the seaplane, the military, and perhaps the Navy alone, should study and develop the best possible system to handle the cargo transferring issues, especially in rough seas.

So, if the Navy is to operate the seaplane along with JLOTS assets as the primary means of transferring supplies from the sea base to the theater of operations, there needs to be considerable thought given to how the plane will be operated and serviced during the course of high-tempo operations. Considerations include payload transfer both from the sea base and on shore, maintenance, mooring, and mission reconfiguration. This also includes the maintenance and repairs of a seaplane while deployed. In particular, corrosion control in a salt water environment will be a major maintenance challenge. An additional airframe platform in the inventory should also be examined for patrol, reconnaissance, command and control possibilities as well to make the new airframe as versatile and operationally multipurpose as possible. However, as previously mentioned, the seaplane represents one of the few alternatives for transferring the volume of supplies needed to support deep inland military operations from a sea base.

Logistics maritime force protection

For the most part, over the past 30 years the U.S. Navy has conducted logistics operations in a benign environment. During the military operations that took place in Grenada, Bosnia, Somalia, Iraq in 1991, and Iraq in 2003 our forces met with little no or no resistance from a hostile Navy. To some extent, little planning has been given to providing force protection to logistics ships. For example, the ammunition ships operated by MSC will sail unescorted into the Iraqi theater of operations. In the recent conflict between Israeli military forces and Hezbollah, a single missile caused extensive damage to an Israeli naval ship. We see that a determined adversary, even from developing countries, could severely damage the logistics distribution process with only a few surface-to-surface missiles. Hence, the U.S. cannot ignore force protection issues with respect to its logistics ships. Despite the inherent protection provided by the great expanse and large stand-off distances of the ocean, our logistics vulnerability on the open oceans is real.

The Navy is clearly the only branch of the U.S. military that is capable of providing maritime force protection in joint logistics operations. When provided with the necessary weapons platforms, the future Littoral Combat Ships (LCSs) would possess the speed to provide force protection but not perhaps the necessary range or endurance [45]. The HSV, when outfitted with a helicopter pad, appropriate sensors and communication equipment, and armaments, would be a formidable ship for providing force protection, not only for logistics ships but also as a credible extension of the fleet battle group. Their primary mission would be to escort and protect Army transport HSVs and MSC cargo ships. Armed HSVs with proper command and control communications would also be excellent platforms for providing small battle force embarked JTF staffs with support for humanitarian assistance and contingency operations. The Navy can be a big contributor to the joint force by being able to provide joint command and control spaces upon Naval vessels. Not only HSVs and LCSs for littoral type operations, but larger combatants as well depending on the size of the operation.

An armed and reconfigured HSV, given its speed and shallow draft, could provide significant force protection at those locations where it might not be prudent to send an entire strike force. The helo deck, large cargo capacity, range, and shallow draft make the HSV an ideal support ship for the reconstituted riverine expeditionary forces. The maneuverability of these vessels makes it ideal for providing force protection not only from hostile navies but also from pirates and violent maritime political extremists in choke points around the world. An HSV can provide logistics transferring support from the sea base to shore and the same ship frame, when properly armed and outfitted, becomes a valuable asset to the battle network.

These force protection HSVs should be manned by military blue and gold rotating crews and forward deployed to maximize time on station and maritime situational awareness. The HSV's smaller size, when paired with a military crew, enables port calls in smaller ports to help build international partnerships and good will. Detachments of Construction Battalion personnel embarked with equipment and supplies would allow humanitarian assistance support on a smaller scale in other countries. Finally, with military crews and embarked Coast Guard detachments, these force protection HSVs could be very valuable assets for combating drug smuggling and other criminal activity.

By comparing these long-term actions to the JTL critical capabilities found in table 7, support would be gained in each category of capabilities (see and sense, respond, and collaborate). In particular, the areas of optimizing sustainment of joint forces, synchronizing inter- and intratheater deployment and distribution, direct assignment of intratheater transportation assets, joint munitions management, joint subsistence and water management, and COCOMs/JTFs/Service components coordination would be improved.

How would these longer-term actions help with the JTL issues identified earlier? Table 11 shows the issues that could be improved as a result of taking these steps.

Table 11. Summary of future joint support opportunities influence on maritime JTL issues

	Maritime JTL issues					
Future joint support opportunities	Service responsibility	COCOM responsibility	JDDOC maritime support	Peacetime / wartime structure	Maritime common lift	Logistics force protection
Additional logistics high speed vessels			X		X	
Sea base development			X			X
Amphibious seaplanes			X		X	
Maritime force protection vessels						X

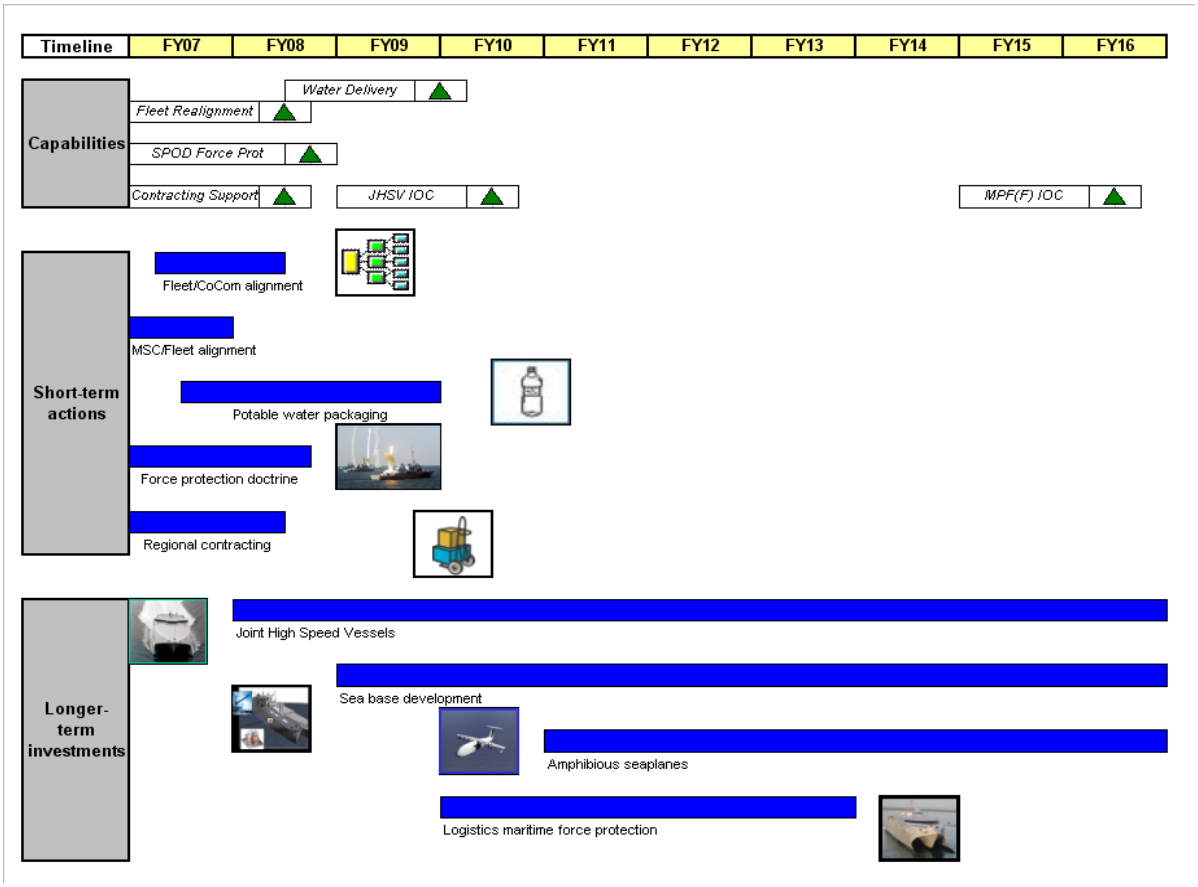
These suggested future capabilities would help correct the lack of maritime common lift capability and provide additional logistics force protection. In addition, they would improve JDDOC maritime support by providing additional common use assets which could be tasked by the COCOM.

Each of the above possible investments should be examined by the Navy as to their reasonableness for implementation. Since they require significant platform capital investments, they have to be evaluated against other future expenditures in terms of capability gain for dollar spent. However, each of these support concepts would add significant capability to maritime joint logistics operations.

Roadmap for maritime joint theater logistics development

This study has generated several recommendations and ideas for improvement of the maritime support for JTL. We have built a rough development roadmap for improvement which can be used as a summary of the ideas and a tool for further discussion. Figure 12 provides a visual synopsis of the roadmap.

Figure 12. Maritime joint theater logistics development roadmap



As one can see, there are four sections to the roadmap—the time-line in fiscal years, the desired joint capabilities, the short-term actions, and the longer-term investments. The road map shows the rough time-line relationship between each of the short-term and longer-term initiatives.

Conclusion

The intent of this study was to look at joint theater logistics and the role that maritime support can play within it. We explored current doctrine and looked at actual logistics structures and operations within PACOM as a case study. We isolated the key maritime strengths which could be leveraged to better support joint logistics operations. We then attempted to generate both short-term and longer-term actions which could help the Navy better support joint logistics operations.

The most surprising aspect of this study was, for us, the realization of how different each of the military Services' logistics doctrines are from each other. The different operational requirements are based on the fundamentally unique natures of land, air, and maritime combat. This has resulted in five very different approaches to joint theater logistics. The fifth approach being that of the COCOM organization itself, which is focused more on ability to control and direct existing logistics assets rather than the ability to acquire, move, and deliver logistics materiel. The Navy's deployment operational concept, large organic logistics capacity, capability to produce its own potable water, and accompanying combat logistics ships make the fleet units independent, mobile, and able to stay on station for very long periods of time.

This results in the Navy's sole logistics support need of spare parts and replacement equipment for those items which break or are damaged unexpectedly. The Navy's High Yield Logistics focus is entirely centered on reducing the need for spare parts. Increasing the size of ordered items under the Worldwide Express (WWX) commercial air shipment contract from up to 150 pounds to up to 300 pounds will probably help the Navy more than anything with logistics spare parts support. There is little the Navy needs in terms of joint support from the other Services for fleet units. Although there are occasions when supplies are delivered to the wrong ALSS or RLS because the

requiring fleet units have moved out of the area. During those times, the Navy takes advantage of the joint tactical common use air and land assets to transfer the materiel to the correct ALSS or RLS.

Even though the Navy does not require much outside joint theater support, there is a great deal more the Navy can do to support the joint forces. In order for the Navy to significantly increase joint logistics support, it must acquire tactical sealift capability. It has no common user tactical sealift capacity at present. The Navy should strongly consider acquiring more high-speed cargo vessels, similar to the Westpac Express and Joint Venture, and consider crewing them with MSC personnel or contractors. In addition, the Navy should review the desirability of adapting some of the new high-speed cargo vessels to warfighting convoy capability by arming them and providing fleet Intelligence, Surveillance, and Reconnaissance (ISR), and defensive capabilities. In addition to performing escort duties, this new class of warships could patrol and protect logistics choke points as well as serve as ideal motherships for the reconstituted expeditionary riverine forces. They could also serve as support for small battle force embarked JTF staffs for HA and contingency operations. While the new LCS class of ships should have the speed to keep up with the HSVs, they do not presently have sufficient range or presence ability. Maritime force protection is not a major consideration at present, but a determined adversary with minimum ocean-going warfighting capability could be a serious threat to unarmed HSVs and MSC cargo ships. Cheap surface-to-surface missiles would be the greatest problem, with mines and waterborne suicide bombers also significant threats.

The other major capability the Navy needs in order to increase joint theater logistics support is to develop an airlift capacity for 50 to 70 tons from the sea base over a delivery range of 1,000 miles or more. The amphibious seaplane concept is currently one of the few attractive methods for doing this as vertical lift aircraft cannot meet the range and cargo lift requirements. Throughput and timeliness of materiel delivery will always remain the key metric of logistics support. The possibility of airlifting a C-17-sized load of materiel directly from a MPF(F) or CLF vessel to the closest FOL in theater without cargo transfer should be very attractive and valuable to Army and

Marine Corps field commanders. While how to best transfer, load, and unload amphibious seaplanes in high sea-states remains an issue, basic seaplane technology is proven and the Navy has had experience with docking, operating, and maintaining seaplanes. Unfortunately, much of this expertise has probably been lost over time.

The Navy could also improve the support it provides to joint theater logistics through improvements in coordination among staffs, expanding the roles of regional contracting offices to support other Services, and partnering with the other Services to improve logistics command and control by standardizing logistics tracking, labeling, and packaging systems. While these short-term changes do not make a huge increase in joint theater logistics support capability, they also are not necessarily expensive to implement

In summary, the Navy logistics support system is robust, independent, and self-sufficient to the point that normally little assistance is necessary from its joint partners. However, there is much the Navy could do to support the other Services if it invested in common use tactical sealift, such as the HSV concept, and acquired amphibious seaplanes that could bridge the gap from the sea base to points over 1,000 miles inland. In addition, only the Navy can provide maritime force protection, and although the current warfighting ships are very capable, there may not be enough to cover the territory if our current benign maritime logistics operating environment changes.

Glossary

AAFES	Army Air Force Exchange Service
AEF	Air Expeditionary Force
AEW	Air Expeditionary Wing
AFMC	Air Force Materiel Command
AFSB	Army Field Support Brigade
ALSS	Advanced logistics support site
AMC	Air Mobility Command (Air Force)
AMC	Army Materiel Command (Army)
AMD	Air Mobility Division
AOR	Area of Responsibility
APOD	Aircraft port of debarkation
APOE	Aircraft port of embarkation
ASCC	Army Service Component Commander
ASG	Area Support Group
BCT	Brigade Combat Team
BLST	Brigade Logistics Support Team
CENTCOM	Central Command
CFACC	Combined Force Air Component Commander
CFFC	Commander, Fleet Forces Command
CFLCC	Combined Force Land Component Commander
CLB	Combat Logistics Battalion
CLC	Combat Logistics Company
CLF	Combat Logistics Force
CLR	Combat Logistics Regiment
CNA	Center for Naval Analyses
COCOM	Combatant Commander
COMNAVFOR	Commander Naval Forces
COMPACFLT	Commander, Pacific Fleet
CONPLAN	Contingency Plan
CONUS	Continental United States
CPF	Combat Prepositioning Force
CSL	Continental United States Support Location

CSF	Combined Support Force
CSG	Combined Support Group
CSG-9	Carrier Strike Group 9
CSS	Combat Service Support
CTF	Combined Task Force
CULT	Common User Land Transportation
DCP	Deployable Command Post
DDOC	Deployment and Distribution Operations Center
DeCA	Defense Commissary Agency
DIRMOBFOR	Director of Mobility Forces
DLA	Defense Logistics Agency
DLB	Defense Logistics Board
DLE	Defense Logistics Executive
DOD	Department of Defense
DPO	Distribution Process Owner
DS	Distance Support
DSA	Defense Supply Agency
EAC	Echelon Above Corps
ESG-5	Expeditionary Strike Group 5
EUCOM	European Command
FARP	Forward Arming and Refueling Point
FISC	Fleet Industrial Supply Center
FLOW	Focused Logistics Wargame
FLS	Forward logistics site
FOL	Forward Operating Location
FSL	Forward Support Location
GPH	Gallons Per Hour
GSA	General Services Agency
GWOT	Global War on Terrorism
HA	Humanitarian Assistance
HET	Heavy Equipment Transporter
HQ	Headquarters
HSV	High Speed Vessel
ISB	Intermediate Staging Base
ISR	Intelligence, Surveillance, and Reconnaissance
JCS	Joint Chiefs of Staff
JDDOC	Joint Deployment and Distribution Operations Centers

JFCOM	Joint Forces Command
JTF	Joint Task Force
JTL	Joint Theater Logistics
LCAC	Landing Craft Air Cushion
LCM	Landing Craft, Mechanized
LCS	Littoral Combat Ship
LCU	Landing Craft, Utility
LMSR	Large, Medium Speed Roll-on/Roll-off
LNO	Liaison officer
LOTS	Logistics Over The Shore
LPS	Logistics Prepositioning Ships
LSE	Logistics Support Element
LSV	Logistics Support Vessel
MAGTF	Marine Air Ground Task Force
MARFORPAC	Marine Corps Forces Pacific
MATCOM	Materiel Command
MEF	Marine Expeditionary Force
MHLD	Maritime Homeland Defense
MLC	Marine Logistics Command
MLG	Marine Logistics Group
MPF	Maritime Prepositioning Force
MPF(F)	Maritime Prepositioning Force (Future)
MPSRON-3	Maritime Prepositioning Squadron 3
MSC	Military Sealift Command
MWOT	Maritime War on Terrorism
NATO	North Atlantic Treaty Organization
NAVSUP	Naval Supply Systems Command
NDRF	National Defense Reserve Fleet
NGO	Non-Governmental Organization
NOLSC	Naval Operational Logistics Support Center
NORTHCOM	Northern Command
NRCC	Navy Regional Contracting Center
OEF	Operation Enduring Freedom
OFDA/DART	Office of Foreign Disaster Assistance/Disaster Assistance Response Team
OIF	Operation Iraqi Freedom
OPLAN	Operations Plan
OPNAV	Office of the Chief of Naval Operations

OPS	Operations
OUA	Operation Unified Assistance
PACAF	Pacific Air Forces
PACOM	Pacific Command
PDDOC	Pacific Command Deployment and Distribution Operations Center
PLS	Palletized Load System
POD	Port of Debarkation
POL	Petroleum, Oil, and Lubricants
PVO	Private Voluntary Organization
QDR	Quadrennial Defense Review
RFI	Radio Frequency Identifier
ROWPU	Reverse Osmosis Water Purification Unit
S&S	Supply and service
SDDC	Surface Deployment and Distribution Command
SECDEF	Secretary of Defense
SECSTATE	Secretary of State
SMFT	Semi-trailer Mounted Fabric Tanks
SOCPAC	Special Operations Component, United States Pacific Command
SOUTHCOM	Southern Command
SPMAGTF	Special Purpose Marine Air Ground Task Force
SPOD	Ship port of debarkation
SPOE	Ship port of embarkation
ST	Supply Train
TACC	Transportation Air Component Command
TLOC	Tactical Logistics Operation Center
TOE	Table of Equipment
TSA	Theater Support Command
TSC	Theater Sustainment Command
TSV	Theater Support Vessel
UN	United Nations
USA	United States Army
USAF	United States Air Force
USAID	United States Agency for International Development
USARPAC	United States Army, Pacific Command
USJFCOM	United States Joint Forces Command

USMC	United States Marine Corps
USN	United States Navy
USTRANSCOM	United States Transportation Command
WWX	Worldwide Express
XO	Executive officer

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