

USAWC STRATEGY RESEARCH PROJECT

**WARTIME DISTRIBUTION OPERATIONS: ROLES OF FOCUSED
LOGISTICS, VELOCITY MANAGEMENT, STRATEGIC DISTRIBUTION
POLICY, AND AIR CLEARANCE POLICY**

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This SRP is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

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ABSTRACT

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This paper analyzes the guidance in the current *Focused Logistics Campaign Plan* and assesses the effectiveness of Department of Defense (DoD) and service policies on materiel consolidation and air clearance authority. The paper argues that developing common DoD and services' policies for materiel consolidation and air clearance will result in a more effective joint distribution system. After Operation Desert Storm, the U.S. Army took the lead in reviewing its supply chain process in order to implement improvements through more effective practices and policies. This process improvement program was called Velocity Management (VM). VM has enabled the Army to significantly reduce its peacetime CWT for high-priority materiel. Customer wait time segments span the entire strategic and theater distribution system. Policy and practices implemented at the strategic level significantly impact the effectiveness of the theater distribution system and defense transportation system. Using RAND studies and current DoD policy, this SRP analyzes current joint guidance, Army Velocity Management, materiel consolidation guidance for the Army and Marine Corps in Operation Iraqi Freedom, and a comparison of our services' air clearance policies. This analysis demonstrates the need for the DoD to update and standardize policy for materiel consolidation and air clearance.

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WARTIME DISTRIBUTION OPERATIONS: ROLES OF FOCUSED LOGISTICS, VELOCITY MANAGEMENT, STRATEGIC DISTRIBUTION POLICY, AND AIR CLEARANCE POLICY

This strategy research project (SRP) uses the guidance in the current *Focused Logistics Campaign Plan* to assess the effectiveness of Department of Defense (DoD) and service policies on materiel consolidation and air clearance authority. The SRP argues that developing common DoD and services' policies for materiel consolidation and air clearance will result in a more effective joint distribution system.

After Operation Desert Storm (ODS), the U.S. Army took the lead in reviewing its supply chain process and implementing improvements through more effective practices and policies. This new process improvement program was called Velocity Management (VM). VM enabled the Army to significantly reduce its peacetime customer wait time (CWT) for high-priority materiel. CWT segments span the entire strategic and theater distribution system. Policy and practices implemented at the strategic level significantly impact the effectiveness of the theater distribution system and defense transportation system (DTS).

JOINT LOGISTICS MUST BE EFFECTIVE AND EFFICIENT

Future DoD logistics strategy is elaborated in the *Focused Logistics Campaign Plan* (2003). This plan is designed to set a revolutionary joint and integrated course for the joint logistics community at the strategic and operational levels. It proposes future efficient logistics methods for the joint force. One characteristic of future logistics improvements is to "replace mass with speed and precision."¹ Essentially this means future military campaign's would not rely on large stockpiles of supply, but would rely on velocity and accuracy within the supply chain for logistical support. The *Focused Logistics Campaign Plan* calls for logisticians to win the confidence of warfighters by significantly decreasing CWT for materiel and ensuring time definite delivery (TDD).² Focused logistics begins with standardization: "Institute common metrics, standards, and processes that promote simplicity and interoperability across all services. Current nonstandard systems and processes contribute to delaying and reducing warfighter confidence."³

The current DoD logistics community remains a very non-joint system. U.S. Code Title X designates each service as the responsible agent for its logistics. Each service thus uses a service-unique supply chain management system – each with its own set of policies, procedures, and information systems. For example, at the operational and tactical level the U.S. Army uses the Standard Army Retail Supply System, the U.S. Marine Corps uses the Asset Tracking Logistic and Supply System, the U.S. Navy uses Relational Supply, and the U.S.

Air Force uses the Standard Base Supply System. Because of the disparity in these service-unique systems, the services cannot rely on one another's systems either in garrison or in the field. These differences extend beyond their supply chain management systems; they are also reflected in service and DoD policies. Policy differences then create inconsistency in the DTS's handling of the services' materiel:

Presently, the DoD distribution environment consists of unsynchronized segments and distribution nodes, with rescheduling often required at each change of transportation node. DoD employs a myriad of discrete supply chains, but they are not harmonized at the enterprise level. This distribution environment places a heavy materiel-tracking burden on the customer, who usually lacks complete information and end-to-end visibility. This often creates unnecessary uncertainty and workloads at the point of receipt. When the point of receipt is an austere area of conflict, this situation can become especially critical.⁴

During Operation Iraqi Freedom (OIF) this problem contributed to huge delays in materiel distribution in the Iraqi theater of operations. A January 2004 news article based on an interview with Lieutenant General Claude Christianson, the current Army G4 and former OIF Combined Forces Land Component Command (CFLCC) C4 clearly describes the situation:

When the Army, Navy, Air Force and Marines work side by side in the same region, as they did in Iraq, the combined supply system is a clashing mismatch of different cultures, incompatible communications systems, different stock numbers for similar items, even different vocabularies. Keeping track of a spare Marine Corps tank transmission as it moves from a Marine Corps depot to an Air Force cargo plane to an Army truck, for instance, "is one of our biggest challenges...It's a cultural issue, not a technology issue..." Christianson said.⁵

The Government Accounting Office (GAO) has published a preliminary report on defense logistics in OIF. The report cites many joint logistics problems within the Iraqi theater of operations. GAO specified several contributing factors: poor asset visibility, limited theater distribution capability, failure to fix problems cited in lessons learned from ODS, and other various issues. GAO specifically noted materiel delays caused by the need to break down and repack arriving materiel, by problems in prioritizing cargo delivery, and by the inability of untrained personnel to get the job done in theater distribution centers:⁶

The distribution of supplies was also delayed because cargo arriving in shipping containers and pallets had to be separated and repackaged several times for delivery to multiple units in different locations. In addition, DoD's lack of an effective process for prioritizing cargo for delivery precluded the effective use of scarce theater transportation assets.

In addition, logistics personnel were not adequately trained in various logistics functions, such as operating material handling equipment and managing theater distribution centers.⁷

Many problems that emerged during OIF were also evident in ODS, the supply chain system of which was based upon mass. But in the late 1980's industry began adapting new supply chain methods that included distribution-based methodologies. After ODS, the Army initiated a study called Total Distribution which resulted in the Total Distribution Action Plan. This action plan was the genesis for current distribution-based logistics concepts employed by the Army; these concepts will likely shape the future force.⁸ Subsequent to publishing this action plan, Army leaders commissioned the RAND Arroyo Center to begin studying the Army's supply chain in an effort to achieve immediate improvements. This effort resulted in the Army adopting VM.

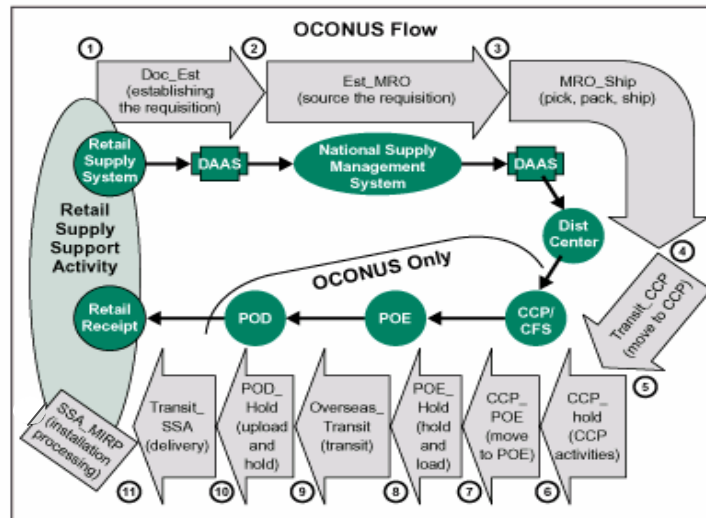
VELOCITY MANAGEMENT – DEFINITION AND HISTORY

Beginning in 1995, the Army undertook an initiative called VM to improve its supply chain business practices. The Army's past practice of supply mass created mounds of materiel – so called Iron Mountains – echeloned at the tactical, operational, and strategic levels. This mass based approach only unreliably satisfied warfighters supply requests. It created massive redundancies in stockage at all levels. So it was grossly inefficient. In 1995 Army leaders shared this view and sought to devise a distribution-based system using VM, which would replace mass with velocity. VM was modeled upon a contemporary business concept used by many corporations worldwide. VM views the supply chain as a set of processes, with interlinked segments. The primary criterion for overall supply chain assessment is CWT. VM measures and analyzes each segment of the chain to optimize its effect on the entire supply chain's performance.⁹

The Army's VM effort was led by the Army Deputy Chief of Staff for Logistics, the Deputy Commanding General of the Army Materiel Command, and the Commanding General of Combined Arms Support Command. These senior logisticians focused the entire Army logistics community in seeking VM process improvements; then they facilitated quick decisions on new policy and process implementation.¹⁰

VELOCITY MANAGEMENT – IMPROVEMENTS IN ARMY LOGISTICS

The VM initiative measured and analyzed critical segments within the supply chain. Analysts understanding of the segment times and processes enabled them to improve the segment and then assess how much this refinement contributed to the total system. The segments were measured and analyzed with data from the Army's logistics intelligence file.¹¹



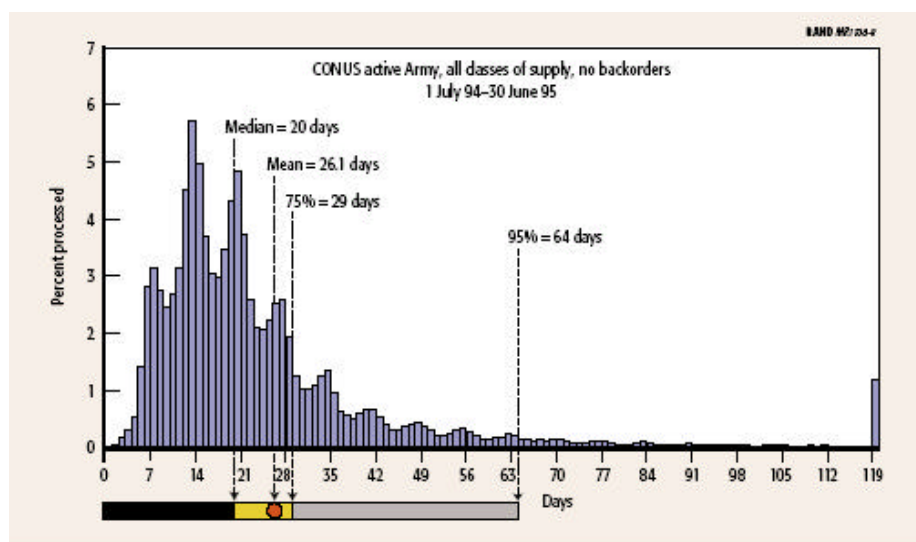
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FIGURE 1. SUPPLY CHAIN MEASURED SEGMENTS¹²

The segments measured included:

1. Doc-Est: Document number date to establish date
2. Est-MRO: Requisition establish date to materiel release order date
3. MRO-Ship: Materiel release order date to ship date
4. Ship-CCP: Ship time from warehouse to consolidation and containerization point
5. CCP Hold: Processing and hold time at consolidation and containerization point
6. CCP-POE: Ship time from consolidation and containerization point to port of embarkation
7. POE Hold: Processing and hold time at port of embarkation
8. POE Ship-POD Rec: Ship time from port of embarkation to port of debarkation
9. POD Hold: Hold time at port of debarkation
10. POD-SSA: Ship time from port of debarkation to retail supply support activity
11. SSA-MIRP: Processing time for receipt processing by requisitioning supply support activity¹³

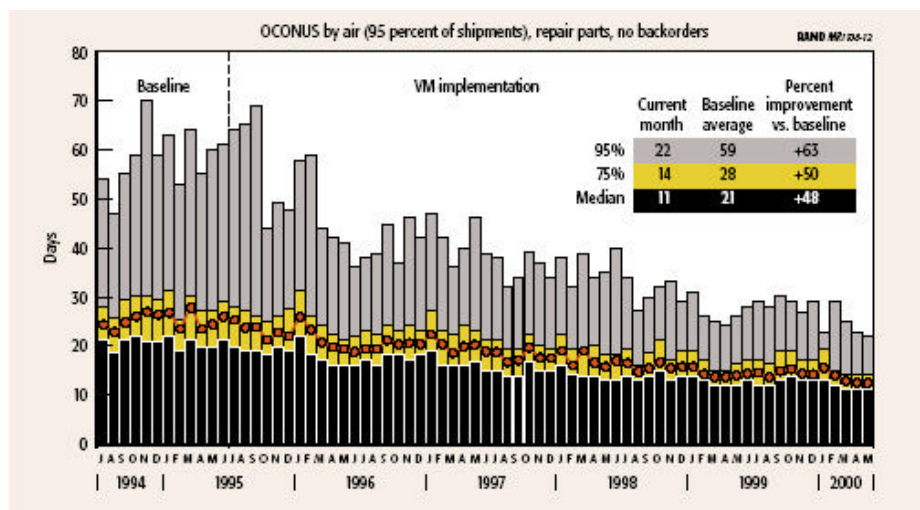
The past method of evaluating CWT performance was simply one of calculating the overall average number of days it took for requested items to process from requisition date to ordering unit receipt processing. This method of evaluating only average CWT masked the variance in actual performance, a significant variation. Therefore, the VM effort adopted a now widely accepted group of four metrics to measure CWT in days. The new method used percentile measurements of 50%, 75%, and 95% along with the mean. The 50th percentile metric measures the median CWT – or the time it takes for the fastest 50% of the total items ordered to be receipted. The 75th percentile metric measures the CWT for the fastest 75% of the total items ordered. Lastly, the 95th percentile metric measures how long it takes for customers to receive 95% of the total items ordered. The last five percent is excluded since it only accounts for outlying data related to various problems that skew the data analysis.¹⁴



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FIGURE 2. 1995 CUSTOMER WAIT TIME 50%, 75%, AND 95% PERCENTILES FOR NON-BACKORDERED SHIPMENTS FILLED FROM NATIONAL SOURCES¹⁵

Over the course of six years from 1994 to 2000, the Army reduced its CWT by more than 50%. In 1994 the average CWTs for outside the continental United States (OCONUS) air shipments were 21 days, 28 days, and 59 days in the 50th, 75th, and 95th respective percentiles. In 2000 these average CWTs for OCONUS air shipments were reduced to 11 days, 14 days, and 22 days in the respective percentiles.¹⁶



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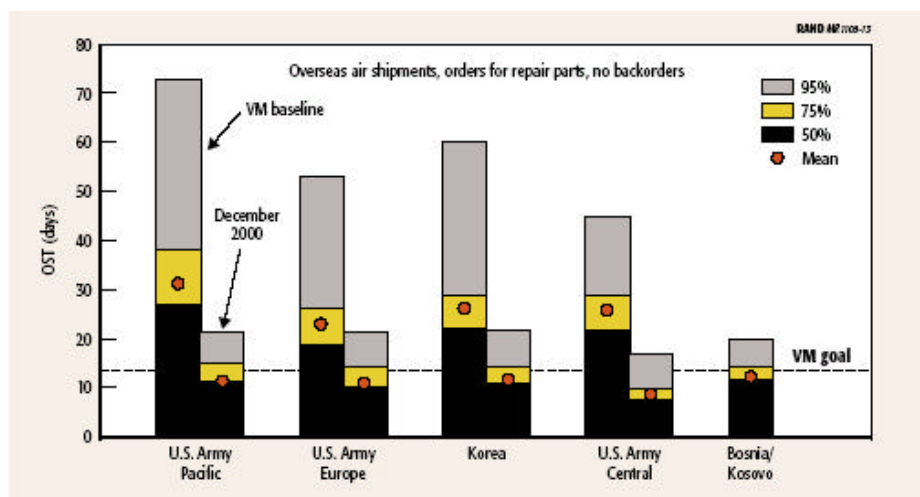
FIGURE 3. CUSTOMER WAIT TIME REDUCTIONS 1994-2000¹⁷

These gains represented great improvements for the peacetime Army – both in improved readiness and in fiscal efficiency. In some cases these improvements led to reductions in forward stocking of materiel at installation, direct support, and unit supply levels as the Army adjusted inventory algorithms based upon faster replenishment times.¹⁸ In addition, Army logisticians assumed that these improvements were systemic and would apply both in peacetime and during deployed operations. In a CASCOM article published in *Army Logistician*, “Velocity Management and the Revolution in Military Logistics,” Thomas Edwards, the Deputy to the CASCOM commander, observes:

Although this discussion of the VM implementation has focused on actions taken to improve CONUS Order Ship Time (OST) in peacetime, many of these actions also helped improve OST for OCONUS units, including those in deployed operations. This was a natural consequence because most of the CONUS segments of the order and ship process are also part of the OCONUS process. The streamlining of ordering, depot processing, and receiving activities contributes to the reduction of both CONUS and OCONUS OST, as does the improved positioning and sourcing of stocks to accommodate the needs of major

customers of the depots. Moreover, the same process changes that make peacetime performance faster and more reliable also contribute to fast, agile, and robust wartime performance.¹⁹

RAND also analyzed whether reduced CWTs would hold true during contingency operations. RAND used data for the Army's deployments to Bosnia and Kosovo for its analysis. RAND found that Army operations in Bosnia and Kosovo benefited from the same supply velocity as that provided to peacetime units through an extension of the VM created supply chain. In RAND's *Velocity Management*, the authors conclude that: "The Army has sustained improved CWT when units deploy to new areas of operations."²⁰ These successes convinced Army leaders and war planners that this new-found velocity in the supply chain should be the accepted method for contingency operations.²¹



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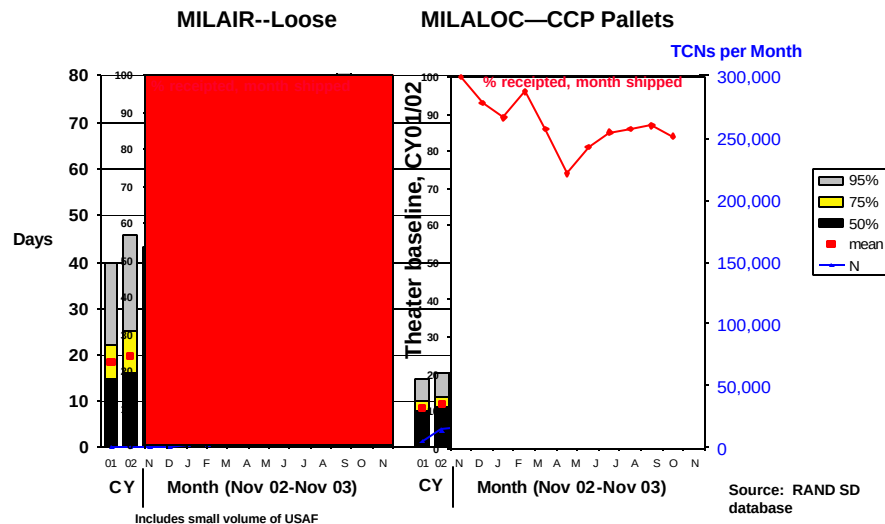
FIGURE 4. CUSTOMER WAIT TIME PRIOR TO OPERATION IRAQI FREEDOM²²

In May 2003 DoD adopted similar metrics for measuring TDD and CWT. These metrics, although not precisely those used in VM, were obviously influenced by the VM effort. These new metrics thus signaled the beginning of a DoD wide standard for measuring CWT by segment. DoD intended that these new metrics would enable the Defense Logistics Agency (DLA) and the services' supply chains to become more effective and efficient.²³

VELOCITY MANAGEMENT – OPERATION IRAQI FREEDOM

The distribution plan for OIF was fundamentally different from the mass-based plan of ODS. Based upon VM principles, the OIF plan depended on velocity, not mass. These principles were consistent with current Army doctrine and practice for high-priority materiel, including 463L pallet load configuration in the continental United States (CONUS) and direct throughput to retail supply support activities. But given the planned logistics force flow for OIF, the theater distribution systems needed to expand at an unprecedented rate, far exceeding peacetime requirements. But in execution the peacetime system was not effectively extended to meet wartime requirements.

RAND conducted a study in late 2003 that sought to identify the underlying causes of distribution problems of high-priority cargo during OIF. This study is based primarily on Army distribution; however, Marine and Air Force distribution are addressed. CWT to Kuwait in December 2002 averaged nine days for MILALOC-CCP and 20 days for MILAIR-Loose. (MILALOC-CCP is materiel consolidated and 463L palletized at a DLA consolidation and containerization point (CCP) and then trucked to an aerial port of embarkation (APOE) for air shipment. MILAIR-Loose is materiel shipped directly to the APOE for consolidation and 463L palletization at the APOE.) By September 2003, six months into the war, both MILALOC-CCP and MILAIR-Loose delivery rates increased to an average of 32 days.²⁴



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FIGURE 5. CUSTOMER WAIT TIME DURING OPERATION IRAQI FREEDOM²⁵

The RAND study sought the root causes for these increases of as much as 200% in CWT. RAND determined the primary causes were at both the strategic and theater levels. The RAND chart below shows how the strategic level DLA segments of MRO-Ship, SHIP-CCP, and CCP-Hold increased significantly from peacetime levels. The theater level PODship-D6S segment identifies the ineffectiveness of the theater distribution system. Interestingly, RAND determined that the theater distribution system was significantly affected by consolidation problems on 463L pallets that occurred at the strategic level, prior to their shipment into the theater of operations.²⁶

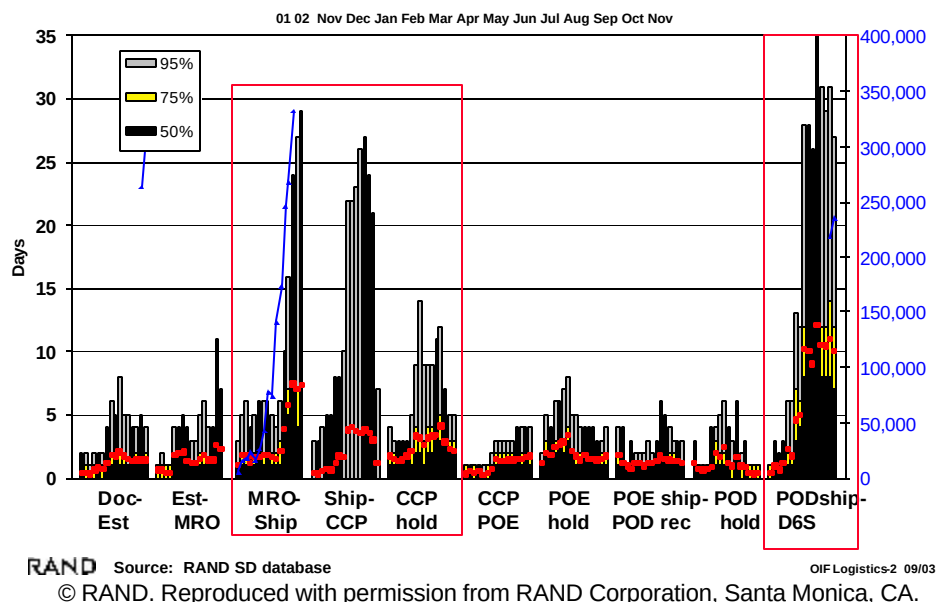


FIGURE 6. DISTRIBUTION SEGMENTS THAT CAUSED MOST DELAYS ²⁷

At the strategic level, the Defense Distribution Depot Susquehanna (DDSP) in Pennsylvania is the primary depot from which Army materiel flowed into the Iraqi theater of operations. DDSP materiel issues to worldwide customers during OIF increased by 400% over pre-war levels. This four-fold increase in volume is cited as the cause of the slowdown in MRO-Ship, SHIP-CCP, and CCP-Hold segment times.²⁸ Planners at United States Central Command (USCENTCOM) did not anticipate that DLA's capacity would not match wartime requirements. Although no one knew with certainty what the actual materiel requirements would be, USCENTCOM did provide DLA with estimated overall requirements for OIF in short tons by class of supply. For high-priority air shipments, USCENTCOM estimated 395 short tons per day at C Day with a peak of 720 short tons per day at C+60.²⁹ These estimates were provided in the

form of cargo increment numbers which are estimates based upon service inputs to the software sustainment estimator named Sustainment Generator (SUSGEN). What remains unclear is whether these data were adequate and whether DLA used the estimates to anticipate this huge workload increase.

DLA did take early steps to mitigate the resulting segment slowdowns from the OIF workload increase by moving some workload to other DLA depots and to the U.S. Air Force Air Mobility Command. However, moving selected pallet build responsibility to U.S. Air Force Air Mobility Command, coupled with consolidation policy problems, had an unintended negative impact on theater distribution.³⁰

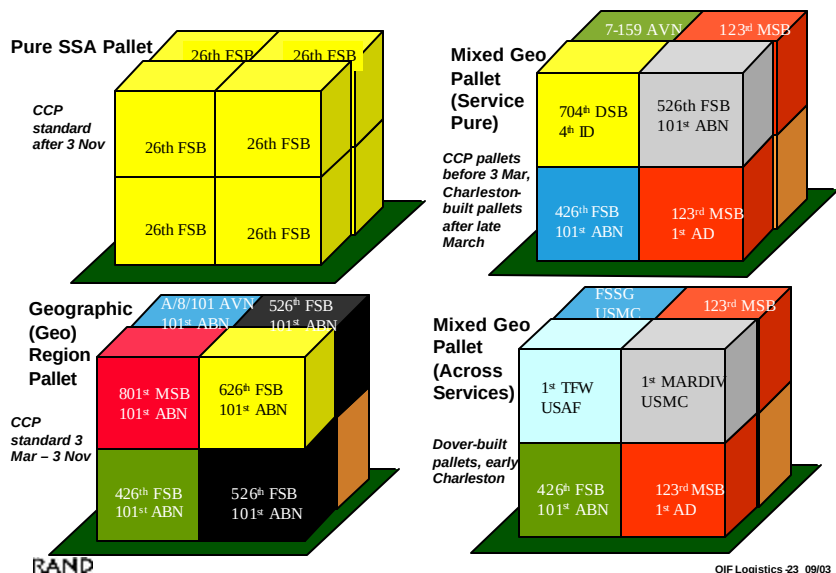
Eight months after the start of OIF, DLA authorized a temporary increase of 400 personnel at DDSP to help reduce the backlog and excessive segment times. Initial reports in December 2003 indicate that DDSP backlogs are decreasing.³¹ Overall, these DLA problems are most likely caused by resource constraints on DLA. DLA lacks a huge surge capability. Simply, this quick 400% increase in workload overwhelmed DLA's ability to sustain pre-war CWT segment times.

In the final analysis Army distribution depends on effective strategic configuration of loads to facilitate velocity at the theater level. Prior to the Army adopting VM, central receiving points would receive all materiel from various transportation modes and configurations and then sort and re-palletize the materiel for shipment to subordinate supply support activities. Historically, this process caused major delays in the velocity of materiel as it arrived at installations' central receiving points. Under VM, these central receiving points were eliminated. Instead, DLA was tasked to sort, pack, and palletize materiel by supply support activity at the strategic level. This allowed materiel to enter the DTS sorted by supply support activity; requisitioned materiel then moved at a high velocity through various transportation nodes without stopping at a supply sorting node.

Pallets for air shipment within the DTS, other than World Wide Express (WWX) shipments, are configured for shipment on Air Force standard 463L pallets. 463L pallets are configured at either the U.S. Air Force APOE or DLA CCP based on DoD Regulation 4500.9-R which determines whether given materiel flows through a CCP or directly to the APOE. These 463L configurations vary greatly in accord with differing service policies on pallet-building procedures used by Air Mobility Command APOEs and DLA CCPs. This is not a joint system. Nowhere within this process does the combatant commander set policy for consolidation to ensure both joint and service effectiveness and efficiency. Even within the services' supply chain policies, consolidation policies are not adequate to ensure service effectiveness and

efficiency of subsequent distribution. The materiel ends up arriving in one of several configurations:

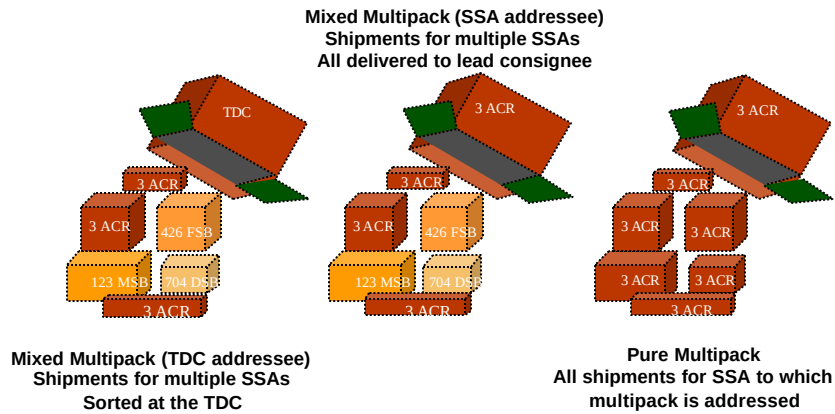
- Mixed Geographic Region – Across Services
- Mixed Geographic Region – Pure Service
- Pure DoD Activity Address Code (DODAAC) – Pure Service
- Pure Supply Support Activity (SSA) – Pure Service
- Single Geographic Region – Pure Service³²



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FIGURE 7. OIF DIFFERENT 463L PALLET CONFIGURATIONS³³

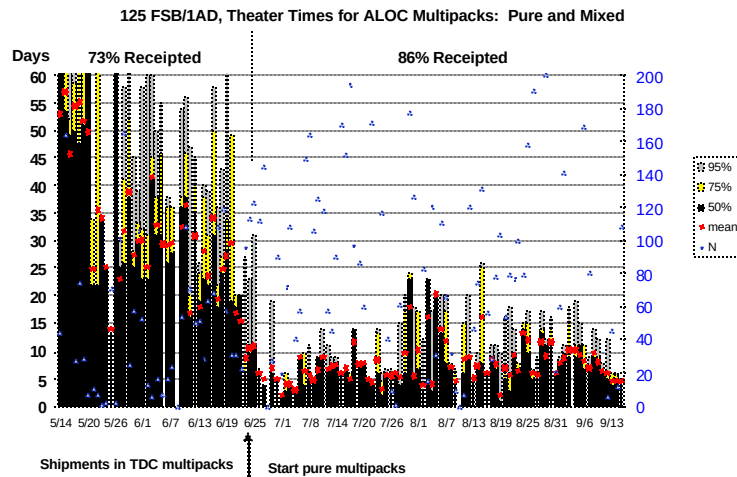
- Within these 463L configurations, materiel is further configured into multi-packs and as loose National Stock Number (NSN) cargo as follows:
 - o No Multi-packs, only loose NSNs built on pallet
 - o Mix of Multi-packs and loose NSNs
 - o Multi-packs only
- Multi-packs in OIF have been configured as follows:
 - o Multipack by DODAAC/SSA
 - o Mixed DODAAC/SSA to Lead Transportation Control Number, SSA, or Distribution Center³⁴



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FIGURE 8. OIF DIFFERENT ARMY MULTIPACK CONFIGURATIONS³⁵

In OIF, these varying packaging and pallet configurations led to significant theater distribution delays for materiel that was not multi-pack or pallet pure for each SSA. RAND's study showed that when the theater received multi-packs and pallets that were configured SSA pure, velocity was sustained. When pallets were received that were not SSA pure or if multi-packs were mixed, the result was decreased receipt rates and theater segment delays.³⁶ But the RAND study concluded that if all echelons employ the VM principles, then the distribution-based supply system is more effective.



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FIGURE 9. EXAMPLE OF SHIFT FROM MIXED TO PURE MULTI-PACKS³⁷

It is clear that Army multi-packs and 463L pallets configured supply support activity pure greatly enhance velocity for theater distribution. Less handling and sorting of materiel significantly reduces delays and losses of materiel. Logistical problems during OIF must not obscure the power of strategic consolidation to enhance velocity at the theater level. DLA clearly did not fully implement the intent of the CFLCC consolidation policy during OIF, so the full benefits of strategic consolidation were not achieved. A series of CFLCC cargo sustainment policy messages on 2 March 2003, 7 March 2003, 29 March 2003, 19 June 2003, 24 June 2003, 15 July 2003, and 6 August 2003 reiterate CFLCC intent for materiel consolidation and detail segregation requirements:

To maximize throughput distribution to the supply support activity (SSA) level, cargo for each supply support activity (SSA) in the theater will be segregated onto separate pallets/containers to the greatest extent possible.³⁸

The 2003 RAND study of OIF logistics offers abundant evidence that strategic consolidation works to improve theater distribution performance. Even though the Army and DLA struggled to implement strategic consolidation during OIF, the effectiveness of the strategic consolidation is indisputable. This effectiveness did not go unnoticed by the joint community. At the beginning of OIF, the U.S. Marine Corps requested DLA to begin using strategic consolidation for Marine shipments.

U.S. MARINE CORPS USE OF DEFENSE LOGISTICS AGENCY CONSOLIDATION AND CONTAINERIZATION POINT DURING OIF

The U.S. Marine Corps supply chain remains rooted in a supply-based system rather than a distribution-based system. During OIF, the Marine Corps encountered similar problems as the Army did with materiel requiring multiple sorts at the operational and tactical levels:

Despite the dispersed nature of Division units (1st Marine Division) across the battlefield, repair parts were often packaged in large "multipacks" with many parts for multiple units placed into a single box and container. This required additional handling at various nodes to redistribute parts, delaying their delivery.³⁹

The original Marine Corps OIF plan called for all Marine Corps high-priority materiel to flow MILAIR-Loose. So unconsolidated materiel would flow to the CONUS APOE, pallets would be built at the APOE, pallets then were moved by the DTS to the OCONUS theater aerial port of debarkation (APOD), materiel would then be transloaded at the APOD by the Army, and then transported to the operational level Marine Logistics Command (MLC) located in Kuwait. The MLC would then sort the materiel at its distribution node. Per DoD Regulation 4500.9-R, Marine Corps high-priority materiel should flow freely as loose items to the APOE, not through the

DDSP CCP.⁴⁰ However, the Marine Corps requested a temporary policy change during OIF to allow their high-priority materiel to flow through the DDSP CCP for consolidation similar to the Army process. The Marine Corps believed this would allow its high-priority materiel to flow quickly through the theater transportation and supply nodes, thereby reducing friction within the DTS, Army theater distribution center (TDC) echelon, MLC echelon, and the tactical distribution level. Although delayed in implementation, this decision reduced CWT by at least three days.⁴¹

Once the war started we realized that this (consolidation) was not occurring because the TDC or CRSP at that time was getting Marine Corps materiel embedded in Army and Navy pallets. Since I had just come from HQ DLA the summer of 02, I called MG Proctor who I worked for and he corrected the problem. What was taking about 5 days to get from the APOD and SPOD to the USMC distribution hub in Camp Fox, Kuwait eventually took less than 2 days.⁴²

Although Marines in the MLC realized a gain in effectiveness using strategic consolidation, no detailed CWT segment data supporting this is currently available. The Marine Corps is currently conducting a comprehensive study on Marine Corps logistics during OIF. More comprehensive data from this study is not yet available.

DOD POLICY FOR CONSOLIDATION AND CONTAINERIZATION POINT USAGE

Individual services have not established policies covering use of DLA's CCPs. Instead, DoD policy directs the services' use of the CCPs in DoD Regulation 4500.9-R. DoD Regulation 4500.9-R states the following about the use of the CCPs:

Since most shippers do not regularly generate full container or 463-L pallet loads of cargo for shipment direct to receivers, the CCP provides a means for combining shipments from multiple shippers. Consider sending these combined shipments directly to single consignees or, as a stop-off or BBP, for multiple consignees. The services and DLA have established CCPs in the CONUS to consolidate cargo for onward movement by SEAVAN or 463-L pallet.⁴³

The policy states that the DDSP will consolidate materiel for both the Army and Air Force in Europe, Southwest Asia, and Africa. The Navy and Marine Corps are not designated to use DDSP CCP for these regions. The Navy and Marine Corps are directed to use the Fleet Industrial Supply Center Norfolk. The Defense Distribution Depot San Joaquin (DDJC) CCP in California will consolidate materiel for the Army, Air Force, Navy, and Marine Corps in the Pacific region. The policy goes on, however, to exclude Air Force, Marine Corps, and Navy high-priority materiel moving under transportation priorities one and two (TP-1 and TP-2). This exclusion essentially makes the Army the only user of the CCP for high-priority air movement consolidation. But for the Army, TP-1 and TP-2 items not requisitioned by a DODAAC identified

as MILALOC will not flow through the CCP.⁴⁴ It is obvious that this portion of the DoD Regulation 4500.9-R was heavily influenced by service parochialism and gives little consideration of the potential joint benefit of strategic consolidation. This policy does little to standardize the way materiel is consolidated at the strategic level. It simply states how each service wants it done.

There is considerable evidence in both peacetime VM data and OIF data that strategic consolidation can make the theater distribution systems more effective. Using strategic consolidation as a joint enabler conforms to the intent of the *Focused Logistics Campaign Plan's* recommendation for common metrics and processes. However, DoD policy does not attempt to standardize consolidation practices for all services into a common process to be used by all services. But without a standardized policy across the services on materiel consolidation at the strategic level, how can Joint theater distribution systems be effectively planned and optimized?

Consolidation policy within DoD Regulation 4500.9-R should be changed to ensure consolidation standardization across the services. A revised consolidation policy in DoD Regulation 4500.9-R should ensure:

- A standard process for all services.
- Maximization of pure multi-packs and 463L pallets.
- Use of DLA's DDSP CCP and DDJC CCP for consolidating all services' materiel, eliminating Air Force, Marine Corps, and Navy's bypass of CCPs.
- Standardized labeling of General Services Administration (GSA), direct vendor, and credit card shipments, which then must be routed through DLA CCPs.
- Frequent publication of DODAAC consolidation and routing guidance by Combatant commanders, not individual component commands or services.
- Establishment of CCP bypass criteria for WWX.

MATERIEL AIR SHIPMENT POLICIES

Unlike in ODS, the December 2003 RAND study showed that the DTS was able to surge to meet the OIF requirements of high-priority shipments by air.⁴⁵ However, under current policy, air shipment authority varies by service. This variation in policy could undermine the combatant commander's priorities by allowing advantage of one service over another in the use of the air channel transportation within the DTS. Within the DLA Distribution Standard System, DLA's stock management system, class of supply is not used to determine mode of shipment. The eligibility of materiel for air shipment is established by policy within the service, not by an overarching DoD policy. Each service has an air clearance authority which uses service policy

to set parameters within the Financial and Air Clearance Transportation System (FACTS). FACTS automatically determines air eligibility and clears cargo within the DTS. Cargo that is challenged by FACTS will be shipped on an exception basis. An air clearance challenge requires establishment of validity of need for air shipment by the individual services' air clearance authority.⁴⁶

TRANSPORTATION PRIORITY

Transportation priority (TP) indicates the preferred mode of shipment for a given shipment. Based upon a shipment's requisition priority designator (PD) a transportation priority of one, two, or three is assigned. The following table displays the normal policy alignment of supply priority, transportation priority, and preferred mode of shipment:

Supply Priority Designator (PD)	Transportation Priority (TP)	Preferred Mode of Shipment
01-03	TP-1	Airlift
04-08	TP-2	Airlift
09-15	TP-3	Sealift

TABLE 1. TRANSPORTATION PRIORITIES⁴⁷

A fourth transportation priority (TP-4) is used for non-air eligible cargo; it is intended to only move cargo by military air on a space available basis.

ARMY AIR CLEARANCE POLICY

Army policy covers the two major modes of air shipment – MILAIR-Loose and MILALOC-CCP. MILAIR-Loose handles supply shipments consolidated for shipment at the Air Mobility Command's APOE. APOE locations are normally Dover Air Force Base, Charleston Air Force Base, Travis Air Force Base, and Norfolk Naval Air Station. MILALOC-CCP supply shipments are consolidated and palletized for air shipment by a DLA CCP; they are subsequently sent to the servicing APOE.⁴⁸ The Army Master Data File (AMDF) specifies an air eligible category (AEC) for each national stock number. Air eligibility is assigned as follows:

AEC Code	Definition
1	Item is provisionally qualified for air shipment. This item will be routinely transported by air on a space available basis.
3	Item is qualified for air shipment. This item will be routinely (mandatory) transported by air.
5	Item is disqualified from air shipment. This item will not be transported by air.

TABLE 2. AIR ELIGIBILITY CODES⁴⁹

Army policy for units designated by the major Army command (MACOM) as MILAIR provides for air clearance or air clearance challenge under the following conditions:

- Air Clearance: TP-1 and TP-2; RDD:999, 777, 555, E, or N; up to 1500 lbs and 150 ft³. Challenge: Over 1500 lbs or 150 ft³.
- Air Clearance: TP-1 and TP-2; Normal RDD: Julian Date; up to 500 lbs. Challenge: Over 500 lbs.
- Air Challenge all: TP-1, TP-2, and TP-3 with blank RDD.^{50 51}

Army policy for units designated by the major Army command (MACOM) as MILALOC provides for air clearance or air clearance challenge under the following conditions:

- Air Clearance: TP-1 and TP-2; Any RDD; up to 10000 lbs. Challenge: Over 10000 lbs.
- Air Clearance: TP-3; AEC-1; up to 1500 lbs. Challenge: Over 1500 lbs.
- Air Clearance: TP-3; AEC-3; up to 1000 lbs. Challenge: Over 1000 lbs.
- Air Challenge all: TP-3; AEC-5.^{52 53}

MARINE AIR CLEARANCE POLICY

Marine policy does not distinguish between the two major modes of air shipment, MILAIR and MILALOC. According to Marine Corps policy, materiel is not shipped through a CCP and is MILAIR by default. Marines categorize air clearance by Transportation Account Codes (TAC) with funding sources – Marine Corps funded (M-TAC or L-TAC) and DLA funded (S-TAC).

For Marine Corps (M-TAC and L-TAC) funded items, Marine policy provide for air clearance or air clearance challenge under the following conditions:

- Air Clearance: TP-1 with any RDD or blank RDD; up to 300 lbs or up to 500 lbs for afloat forces. Challenge: TP-1; any RDD or blank RDD; Over 300 lbs. or over 500 lbs. for afloat forces.
- Air Clearance: TP-2 with RDD 777, 555, 444, or within 8 days of requisition; up to 300 lbs or up to 500 lbs for afloat forces. Challenge: TP-1; any RDD or blank RDD; Over 300 lbs. or over 500 lbs. for afloat forces.
- Air Challenge all: TP-3 or shipment cost in excess of \$5000.⁵⁴

For Marine Corps shipments (S-TAC) funded by DLA, Marine policy provides for air clearance or air clearance challenge under the following conditions:

- Air Clearance: TP-1 and TP-2 with any RDD or blank RDD; up to 2500 lbs. or 250 ft³
- Air Challenge all: TP-3 except for air eligible sensitive or security shipments with a short shelf life.⁵⁵

NAVY AIR CLEARANCE POLICY

Navy policy also does not distinguish between the two major modes of air shipment, MILAIR and MILALOC. Navy materiel is not shipped through a CCP and thus becomes MILAIR by default. The Navy challenges a greater majority of its shipments because the Navy uses mass over velocity by stocking 90 days of stores on most ships. Navy air clearance policy provides for air clearance or air clearance challenge under the following conditions:

- Air Clearance: TP-1 and TP-2; RDD: 999, NMCS, PMCS or requisition less than 90 days old; less than 100 lbs.; less than 15 ft³; air transportation less than \$4000. Challenge: TP-1 and TP-2; RDD: Other than above or blank; requisition 90 days or older; 100 lbs or more; air transportation cost \$4000 or more.
- Air Clearance: Working Capital Fund (DLA/Navy) items; TP-1 and TP-2; RDD: 999, NMCS, PMCS or requisition less than 90 days old; less than 500 lbs.; less than 50 ft³; air transportation cost less than \$4000. Challenge: TP-1 and TP-2; RDD: Other than above or blank; requisition 90 days or older; 100 lbs or more; air transportation cost \$4000 or more.
- Air Challenge all: TP-3.⁵⁶

AIR FORCE AIR CLEARANCE POLICY

Air Force policy also does not distinguish between the two major modes of air shipment of MILAIR and MILALOC. Similar to the Marine Corps, the Air Force categorizes air clearance by TAC with funding sources of Air Force (A-TAC) and DLA funded (S-TAC). Air Force air clearance policy provides for air clearance or air clearance challenge under the following conditions:

- Air Clearance: TP-1; RDD: 999 Challenge: None meeting this requirement.
- Air Clearance: A-TAC; TP-1 and TP-2; RDD: Any other than blank or 999; less than 250 lbs.; less than 25 ft³. Challenge (excluding TP-1 with RDD: 999): exceeds 250 lbs.; exceeds 25 ft³.
- Air Clearance: S-TAC; TP-1 and TP-2; RDD: Any other than blank or 999; less than 500 lbs.; less than 50 ft³. Challenge (excluding TP-1 with RDD: 999): exceeds 500 lbs.; exceeds 50 ft³.

- Air Challenge all: TP-2 and TP-3 with RDD: blank.⁵⁷

NO CONSISTENT AIR CLEARANCE POLICY

The services policies for air clearance are consistent only in that high-priority cargo is authorized air shipment. However, the criteria for TP-1 shipments vary greatly in their thresholds of overweight shipments which will be challenged and perhaps denied. The Army will clear a TP-1 shipment with RDD 999 up to 1500 pounds for MILAIR and 10000 pounds for MILALOC. The Air Force will clear a TP-1 shipment with RDD 999 of any weight. The Navy will clear a TP-1 shipment with RDD 999 up to 100 pounds for Navy funded TACs and 500 pounds for DLA funded TACs. The Marine Corps will clear a TP-1 shipment with RDD 999 up to 300 pounds for Marine funded TACs and 2500 pounds for DLA funded TACs. All services have consistent policies for high-priority materiel up to 100 pounds, but beyond 100 pounds the criteria vary widely. This inconsistency does not permit equitable use of air transportation; rather, it enables the Air Force and Army to dominate premium air transportation. A consistent policy will ensure that the combatant commander can set priorities for air movement of sustainment based on materiel priority of need and combatant commander's priorities, not on service cultures.

CONCLUSION

Using guidance in the *Focused Logistics Campaign Plan*, this SRP analyzed supply distribution system performance to assess policy on materiel consolidation at CCPs and compared the services' different policies on air clearance. Policy and practices at the strategic distribution level significantly impact the effectiveness of the theater distribution system and DTS. A distribution-based supply system can be effective if enabled at all levels of the supply chain. However, if the joint distribution system is not prepared for the required wartime surge in capacity and common logistics policies are not established, understood, and enforced, the overall distribution system will not be wholly effective.

Joint doctrine designates the primary tenants of joint theater distribution as visibility, capacity, and control. All three of these tenants must function effectively in order for joint theater distribution to succeed in expeditionary operations. Joint doctrine establishes centralized management as one of the guiding principles of an effective distribution system.⁵⁸ But currently the services observe different policies on consolidating materiel for air shipment as well as clearance for air shipment of materiel. These policy differences, coupled with different supply chain management systems for each service, weaken the capability of the DTS to effectively support each service's supply chain. The *Focused Logistics Campaign Plan* calls for

consistence in policy and process. Most importantly however, common policy and processes enable the services to operate as a joint force with maximum interoperability of logistics operations.

The DoD should develop new policy and doctrine to ensure an interoperable and standardized distribution system. Specifically, the DoD should revise DoD Regulation 4500.9-R to enable standard processes for all services. The revision should include the following: maximizing pure multi-packs and 463L pallets; using DLA's CCPs to consolidate all services' materiel; labeling standardization of GSA, direct vendor, and credit card shipments; publishing consolidation and routing guidance by Combatant commanders; and standardizing air clearance criteria. These changes would help enable a more effective joint distribution system.

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ENDNOTES

¹ Joint Chiefs of Staff, *Focused Logistics Campaign Plan*, (Washington, D.C.: U.S. Joint Chiefs of Staff, 2003) 32.

² Ibid.

³ Ibid.

⁴ Lou Kratz, "Future Logistics Enterprise," *Logistics Spectrum* 36 (July-September 2002): 28.

⁵ David Wood, "Military Acknowledges Massive Supply Problems In Iraq War," *Newhouse News Service* January 22, 2004 [journal on-line]; available from < <http://www.newhousenews.com/archive/wood012204.html>>; Internet; accessed 23 January 2004.

⁶ General Accounting Office, *Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities during Operation Iraqi Freedom* (Washington, D.C.: U.S. General Accounting Office, 18 December 2003), 3.

⁷ Ibid.

⁸ Combined Arms Support Command, *Distribution-Based Logistics for the Objective Force*, (Fort Lee, VA. Combined Arms Support Command, 31 December 2001), 1-10, 2-2.

⁹ Dumond et al., *Velocity Management-The Business Paradigm That Had Transformed U.S. Army Logistics* (Santa Monica, CA.: RAND, 2001), ix.

¹⁰ Ibid., x-xi.

¹¹ Ibid., 23

¹² RAND Arroyo Center, "CWT and RWT Metrics Measure the Performance of the Army's Logistics Chain for Spare Parts," *RAND Research Note*, (Santa Monica, CA.: RAND, 2003), 5; available from <<http://www.rand.org/publications/RB/RB3035/RB3035.pdf>>; Internet; accessed 23 January 2004.

¹³ Ibid., 4-5.

¹⁴ Dumond, 22.

¹⁵ Ibid.

¹⁶ Ibid., 28

¹⁷ Ibid.

¹⁸ Eric Peltz, RAND Corporation, notes on SRP sent via email to author, 18 Feb 03.

¹⁹ Thomas J. Edwards and Dr. Rick Eden, "Velocity Management and the Revolution in Military Logistics," *Army Logistician* 31-1Jan-Feb 1999 [journal on-line]; available from

<http://www.almc.army.mil/alog/issues/JanFeb99/MS397.htm>; Internet; accessed 23 January 2003.

²⁰ Dumond, 29

²¹ Ibid., 28

²² Ibid., 29

²³ Department of Defense, *DoD Supply Chain Materiel Management Regulation*, DoD 4140.1-R (Washington, D.C.: U.S. Department of Defense, 23 May 2003) 242-248.

²⁴ Eric Peltz and Marc Robbins, *Army Logistics in Operation Iraqi Freedom: Support of Army Units by Strategic Air Distribution*, (Arlington, VA: RAND, January 2004), 15.

²⁵ Ibid.

²⁶ Ibid.17-18.

²⁷ Ibid., 17.

²⁸ Ibid., 65-66

²⁹ Mark Gardner, "Strategic Channel Sustainment Plan," briefing slides, MacDill Air Force Base, USCENTCOM, 13 November 2002.

³⁰ Peltz, 28.

³¹ Ibid., 65-66

³² Ibid., 28, 41

³³ Ibid.

³⁴ Ibid.

³⁵ Ibid.

³⁶ Ibid.

³⁷ Ibid.

³⁸ Commander Combined Forces Land Component Command (CFLCC), USCENTCOM, "CFLCC Kuwait Sustainment Cargo Distribution Policy," *CFLCC Message DTG 022104Z Mar 2003*.

³⁹ United States Marine Corps, "1st Marine Division OIF Lesson's Learned," available from http://www.globalsecurity.org/military/library/report/2003/1mardiv_oif_lessons_learned.doc; accessed 3 February 2004.

⁴⁰ Department of Defense, *Defense Transportation Regulation*, DoD 4500.9-R, (Washington, D.C.: U.S. Department of Defense, May 2003), II-203-32.

⁴¹ James Rubino, LtCol USMC, OIF Marine Logistics Command, email interview by author, 6 Feb 03.

⁴² Ibid.

⁴³ DoD 4500.9-R, II-203-32.

⁴⁴ Ibid.

⁴⁵ Peltz, 17.

⁴⁶ Michael A. Everingham, "Financial and Air Clearance Transportation System (FACTS)," available from <<http://www.navsup.navy.mil/npi/lintest/sepoct00web/everingham.htm>>; Internet; accessed 29 January 2004.

⁴⁷ Department of the Army, *Movement Control*, Field Manual 4-01.30 (Washington, D.C.: U.S. Department of the Army, September 2003), 9-1.

⁴⁸ Peltz, 13.

⁴⁹ Department of the Army, *Cataloging and Supply Management Data Procedures for the Army Central Logistics Data Bank*, Army Pamphlet 708-2 (Washington, D.C.: U.S. Department of the Army, 14 September 2000), 9-1.

⁵⁰ Department of the Army, *Movement of Cargo by Scheduled Military Air Transportation*, Army Regulation 55-9 (Washington, D.C.: U.S. Department of the Army, 2 April 2001), 2.

⁵¹ U.S. Army Materiel Command Logistics Support Agency (LOGSA), "Current Criteria for Challenged Shipments," 12 Feb 2004; available from <<http://www.logsa.army.mil/crit04m.pdf>>; Internet; accessed 13 February 2004.

⁵² Army Regulation 55-9, 2.

⁵³ LOGSA.

⁵⁴ Commandant Marine Corps L LPD, "Changes In Marine Corps Airlift Eligibility Criteria," *CMC Washington DC L LPD Message DTG 172152Z March 2003*.

⁵⁵ Ibid.

⁵⁶ Department of the Navy, *Airlift of Navy Funded/Sponsored Material*, NAVSUP Instruction 4630.22C (Mechanicsburg, PA: U.S. Department of the Navy, 11 June 1998), 2-6.

⁵⁷ Department of the Air Force, *Cargo Movement*, Air Force Instruction 24-201 (Washington, D.C.: U.S. Department of the Air Force, 11 November 2003), 102-104.

⁵⁸ Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Joint Theater Distribution*, Joint Pub 4-01.4 (Washington, D.C.:U.S. Joint Chiefs of Staff, 22 August 2000), 1-7.

BIBLIOGRAPHY

- Combined Arms Support Command. *Distribution-Based Logistics for the Objective Force*. Fort Lee, VA: Combined Arms Support Command, 31 December 2001.
- Commandant Marine Corps L LPD. "Changes In Marine Corps Airlift Eligibility Criteria." *CMC Washington DC L LPD Message DTG 172152Z March 2003*.
- Commander Combined Forces Land Component Command (CFLCC), USCENTCOM. "CFLCC Kuwait Sustainment Cargo Distribution Policy." CFLCC Message DTG 022104Z Mar 2003.
- Department of Defense. *Defense Transportation Regulation*. DoD 4500.9-R. Washington, D.C.: U.S. Department of Defense, May 2003.
- Department of Defense. *DoD Supply Chain Management Implementation Guide*. McClean, VA: Logistics Management Institute, 2000.
- Department of Defense. *DoD Supply Chain Materiel Management Regulation*, DoD 4140.1-R. Washington, D.C.: U.S. Department of Defense, 23 May 2003.
- Department of the Air Force. *Cargo Movement*. Air Force Instruction 24-201. Washington, D.C.: U.S. Department of the Air Force, 11 November 2003.
- Department of the Army. *Cataloging and Supply Management Data Procedures for the Army Central Logistics Data Bank*. Army Pamphlet 708-2. Washington, D.C.: U.S. Department of the Army, 14 September 2000.
- Department of the Army. *Movement Control*. Field Manual 4-01.30. Washington, D.C.: U.S. Department of the Army, September 2003.
- Department of the Army. *Movement of Cargo by Scheduled Military Air Transportation*. Army Regulation 55-9. Washington, D.C.: U.S. Department of the Army, 2 April 2001.
- Department of the Navy. *Airlift of Navy Funded/Sponsored Material*. NAVSUP Instruction 4630.22C. Mechanicsburg, PA: U.S. Department of the Navy, 11 June 1998.
- DeVito, Anthony, Chief, Supply Management Division Defense Logistics Agency Defense Distribution Center. Note on Air Eligibility for U.S. Marine Corps, 26 Nov 03.
- Dumond, John, Marygail K. Brauner, Rick Eden, John Folkesson, Kenneth Girardini, Donna Keyser, Eric Peltz, Ellen M. Pint, Mark Y.D. Wang. *Velocity Management-The Business Paradigm That Had Transformed U.S. Army Logistics*. Santa Monica, CA.: RAND, 2001.
- Edwards, Thomas J. and Dr. Rick Eden. "Velocity Management and the Revolution in Military Logistics." *Army Logistician* 31-1Jan-Feb 1999 Journal on-line. Available from <<http://www.almc.army.mil/alog/issues/JanFeb99/MS397.htm>>. Internet. Accessed 23 January 2003.

- Everingham, Michael A. "Financial and Air Clearance Transportation System (FACTS)." Available from <<http://www.navsup.navy.mil/npi/lintest/sepoct00web/everingham.htm>>. Internet. Accessed 29 January 2004.
- Gardner, Mark. "Strategic Channel Sustainment Plan." Briefing slides. MacDill Air Force Base, USCENTCOM, 13 November 2002.
- General Accounting Office. *Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities during Operation Iraqi Freedom*. Washington, D.C.: U.S. General Accounting Office, 18 December 2003.
- Kratz, Lou. "Future Logistics Enterprise." *Logistics Spectrum* 36 (July-September 2002): 28.
- Peltz, Eric, and Marc Robbins. *Army Logistics in Operation Iraqi Freedom: Support of Army Units by Strategic Air Distribution*. Arlington, VA: RAND, January 2004.
- RAND Arroyo Center. "CWT and RWT Metrics Measure the Performance of the Army's Logistics Chain for Spare Parts." RAND Research Note. Santa Monica, CA.: RAND, 2003. Available from <<http://www.rand.org/publications/RB/RB3035/RB3035.pdf>>. Internet. Accessed 23 January 2004.
- Rubino, LtCol James, USMC, OIF Marine Logistics Command. Email interview by author, 6 Feb 03.
- U.S. Army Materiel Command Logistics Support Agency (LOGSA). "Current Criteria for Challenged Shipments." 12 Feb 2004. Available from <<http://www.logsa.army.mil/crit04m.pdf>>. Internet. Accessed 13 February 2004.
- U.S. Joint Chiefs of Staff. *Focused Logistics Campaign Plan*. Washington, D.C.: U.S. Joint Chiefs of Staff, 2003.
- U.S. Joint Chiefs of Staff. *Joint Tactics, Techniques, and Procedures for Joint Theater Distribution*. Joint Pub 4-01.4. Washington, D.C.: U.S. Joint Chiefs of Staff, 22 August 2000.
- United States Marine Corps. "1st Marine Division OIF Lesson's Learned." Available from <http://www.globalsecurity.org/military/library/report/2003/1mardiv_oif_lessons_learned.doc>. Internet. Accessed 3 February 2004.
- Wood, David. "Military Acknowledges Massive Supply Problems In Iraq War." Newhouse News Service January 22, 2004. Journal on-line. Available from <<http://www.newhousenews.com/archive/wood012204.html>>. Internet. Accessed 23 January 2004.