Class IX Supply Operations in Operation Iraqi Freedom
Is the U.S. Army's Doctrine Adequate?

A Monograph
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14. ABSTRACT

Despite the overall success of U.S. Army forces during the "major combat operations" phase of Operation Iraqi Freedom (OIF), there is a widely held perception that the logistics system was far less effective than it should have been during OIF. The Class IX (repair parts) supply system, in particular, seems to have been almost completely ineffective within the theater of operations. This paper examines whether the Army's doctrine for Class IX supply operations needs to be revised in light of the Army's OIF experience. It first examines the Army's Class IX supply doctrine at the time of OIF, to include the changes implemented over the past decade due to the shift from a supply-based to a distribution-based logistics system. It then examines the OIF experience, and demonstrates that a late deployment of CSS units to the theater, a significant shortage of transportation and other CSS units, an inadequate tactical communications infrastructure, and insufficient Automated Identification Technology (AIT) and In-transit Visibility (ITV) systems all had major negative impacts on the Class IX supply system. It also examines OIF units' experiences, both positive and negative, with their Authorized Stockage List (ASL) and Prescribed Load List (PLL) repair parts stockpiles. Finally, this paper compares the OIF experience to doctrine, using as a framework the principles of distribution from Joint Publication 4-01.4, Joint Tactics, Techniques, and Procedures for Joint Theater Distribution, and Field Manual 100-10-1, Theater Distribution. This comparison revealed that the failure of the Class IX supply system during Operation Iraqi Freedom did not result from flaws in the Army's doctrine, and therefore, the doctrine itself does not need revision. Rather, the breakdown of the Class IX theater distribution system resulted from two main causes outside of doctrine. The first of these was the failure to deploy CSS forces early enough and in sufficient numbers to support an operation the size of OIF. The second was the Army's failure to field adequate numbers of the enablers required for a distribution-based logistics system to work, particularly such items as adequate long-range communications systems, AIT systems, and ITV systems. For its Class IX supply system to succeed in future operations, the Army must field the necessary enablers for distribution-based logistics, make certain other improvements to Class IX-related systems and policies, and ensure that adequate logistics forces are deployed for future contingency operations.

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Abstract

CLASS IX SUPPLY OPERATIONS IN OPERATION IRAQI FREEDOM: IS THE U.S. ARMY'S DOCTRINE ADEQUATE? By MAJ Ted R. Stuart, U.S. Army, 85 pages.

Despite the overall success of U.S. Army forces during the "major combat operations" phase of Operation Iraqi Freedom (OIF), there is a widely held perception that the logistics system was far less effective than it should have been during OIF. The Class IX (repair parts) supply system, in particular, seems to have been almost completely ineffective within the theater of operations.

This paper examines whether the Army's doctrine for Class IX supply operations needs to be revised in light of the Army's OIF experience. It first examines the Army's Class IX supply doctrine at the time of OIF, to include the changes implemented over the past decade due to the shift from a supply-based to a distribution-based logistics system. It then examines the OIF experience, and demonstrates that a late deployment of CSS units to the theater, a significant shortage of transportation and other CSS units, an inadequate tactical communications infrastructure, and insufficient Automated Identification Technology (AIT) and In-transit Visibility (ITV) systems all had major negative impacts on the Class IX supply system. It also examines OIF units' experiences, both positive and negative, with their Authorized Stockage List (ASL) and Prescribed Load List (PLL) repair parts stockpiles. Finally, this paper compares the OIF experience to doctrine, using as a framework the principles of distribution from Joint Publication 4-01.4, *Joint Tactics, Techniques, and Procedures for Joint Theater Distribution,* and Field Manual 100-10-1, *Theater Distribution.*

This comparison revealed that the failure of the Class IX supply system during Operation Iraqi Freedom did not result from flaws in the Army's doctrine, and therefore, the doctrine itself does not need revision. Rather, the breakdown of the Class IX theater distribution system resulted from two main causes outside of doctrine. The first of these was the failure to deploy CSS forces early enough and in sufficient numbers to support an operation the size of OIF. The second was the Army's failure to field adequate numbers of the enablers required for a distribution-based logistics system to work, particularly such items as adequate long-range communications systems, AIT systems, and ITV systems. For its Class IX supply system to succeed in future operations, the Army must field the necessary enablers for distribution-based logistics, make certain other improvements to Class IX-related systems and policies, and ensure that adequate logistics forces are deployed for future contingency operations.

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CHAPTER ONE

INTRODUCTION

Despite the overall spectacular success of U.S. Army forces during the "major combat operations" phase of Operation Iraqi Freedom (OIF), there is a widely held perception within the Army that Combat Service Support (CSS) did not function nearly as effectively as it should have during the campaign. This perception is exemplified by the statement of a senior member of the Army's OIF Study Group, while addressing students at the U.S. Army's Command and General Staff College, that "Logistics is broken."[1] Given that Army and Marine forces managed to fight for more than three weeks while advancing over 500 kilometers from Kuwait to Baghdad, it would appear that logistics cannot have been entirely "broken." However, even the most cursory reading of unit After Action Reviews (AARs) and post-combat interviews provides a clear indication that the logistics system frequently did not function as well as most people would have liked. One early study of the lessons of the Iraq war states that "unit reports at the company and battalion level . . . are filled with accounts of problems and delays in getting adequate supplies."[2]

Some of the most severe logistic shortcomings seem to have been with the Class IX (repair parts) supply system. Account after account describes minimal (or no) Class IX ever reaching forward units, vehicles abandoned or forced to fight with degraded capabilities for lack of spare parts, vehicles cannibalized to keep other vehicles in the fight, and units forced to send their own assets far to the rear in an effort to obtain needed parts. An interview with the S4 (Supply Officer) of the 3d Infantry Division's 1st Brigade Combat Team (BCT) and the Support Operations Officer of the BCT's supporting Forward Support Battalion (FSB) captured the

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[1] Statement during the summer of 2003, by a senior participant in the Army's OIF Study Group, to the incoming class of the Army's Advanced Military Studies Program (AMSP). Statements by speakers at the Command and General Staff College are traditionally "not for attribution."

[2] Anthony H. Cordesman, *The Lessons of the Iraq War: Executive Summary, Eleventh Working Draft: July21, 2003* (Washington, D.C.: Center for Strategic and International Studies, 2003), 26; available from http://www.csis.org/features/iraq_instantlessons_exec.pdf; Internet; accessed 29 February 2004.

prevailing opinion about Class IX among frontline logisticians: "The biggest challenge! Bottom line…it was broke."[3]

Clearly, the failures of the Class IX supply system in OIF were not severe enough to cause the Coalition attack to fail. They were certainly expensive, however – in equipment lost, in resources diverted from other tasks, and perhaps in opportunities missed and lives lost. Such failures in the future, against a more capable enemy or in a longer campaign, might be disastrous. Thus, it seems worthwhile to examine the causes of the Class IX supply problems in OIF and determine what, if anything, needs to be changed with the Army's Class IX supply doctrine.

An investigation of the OIF Class IX failure is likely to pay dividends for other classes of supply as well. While in many respects Class IX is the most difficult class of supply to manage, it was far from the only class that gave problems during OIF. Classes I (food), IIIP (packaged petroleum products), IV (construction and barrier material), V (ammunition), and water all caused significant concern as well.[4] In fact, one tank battalion headquarters company commander from the 3d Infantry Division (3ID) stated that "The only CSS success during the war, from my perspective, was fuel."[5] It seems reasonable to assume that whatever factors hampered Class IX resupply may have influenced all the various classes of supply.

Impact of Class IX re-supply failure

Given that the "major combat operations" portion of Operation Iraqi Freedom only lasted a bit over three weeks and Coalition forces seemed to win quite convincingly in seizing Baghdad

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[3] Major Demitrius L. Jackson, "MAJ David A. Priatko (S4, 1BCT, 3ID) and MAJ Derrick J. Norman (SPO, 3 FSB, 3ID) interview;" OIF Study Group, 15 May 2003.

[4] See, for example, "Report Details Myriad Problems in Division," Houston Chronicle, 7 December 2003, 52A, for a discussion of supply problems in the 3d Infantry Division, based on the division's After Action Review. The military divides supply items into ten "classes," or categories. Class III has two sub-categories: IIIB, or bulk fuel, and IIIP, meaning packaged petroleum products, with "packaged" referring to products that come in containers up to and including 55 gallon drums. For a complete listing of the classes of supply, see Department of the Army, *FM 4-0, Combat Service Support* (Washington, D.C.: 2003), 6-3 to 6-9.

[5] Captain Jason A. Miseli, "The View From My Windshield: Just-in-Time Logistics Just Isn't Working," *ARMOR*, September-October 2003, 11.

and deposing the Saddam Hussein regime, did an inadequate supply of spare parts for the forward

units really matter?[6] In the big picture, perhaps it did not. However, had any of a number of

variables been different, it is not difficult to foresee that the effects might have been severe, even

catastrophic. Even in the actual event, despite the Coalition's overall success, the lack of spare

parts exacted a significant price in lost equipment and combat power. A few examples will serve

to illustrate this.

Task Force (TF) 2-69 Armor reached Baghdad on 6 April 2003. In the words of Captain

Jason A. Miseli, its headquarters company commander,

> TF 2-69 Armor limped into Baghdad due to extremely limited class IX resupply
> during the war. Upon occupation of forward operating base Panther [in the vicinity of
> Baghdad], the TF rolling slant (number of combat vehicles that could shoot, move, and
> communicate even with limitations) was 29 of 30 tanks and 13 of 14 Bradley Fighting
> Vehicles (BFV). However, the actual slant (per –10 [technical manual]) standards was 0
> of 30 tanks and 7 of 14 BFV. . . . These vehicles . . . illustrate that big, heavy class IX
> items, such as track, road wheels, road arms, and torsion bars, which a task force cannot
> carry in significant quantities, greatly affect operational readiness rates.[7]

Captain Miseli stated, "With the exception of one delivery of road wheels and M1 track

in early April, we did not receive any significant class IX deliveries during the war."[8] Writing in

May 2003, he continued,

> Our expectation on consolidation in Baghdad was simple – now that we were no
> longer attacking across Iraq, knowingly outpacing our logistics, we should see non-
> mission capable [i.e., high priority] class IX components flow forward. That expectation
> was not to be met. Instead of the class IX floodgates opening, we saw barely a trickle,
> and 5 weeks later, we still sit at an actual slant of 0 for 30 tanks and 7 for 14 BFVs. . . .
> even now, our maintenance technician and support operations officer fight for the
> simplest of parts, such as HMMWV[9] tires, to keep our essential wheels moving.[10]

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[6] OIF ground combat operations started on the night of 20-21 March 2003. The regime in Baghdad
effectively ceased to function on 9 April and by about 11 April, organized resistance in and around
Baghdad had ceased and coalition forces were continuing north from Baghdad to occupy the rest of Iraq.
For a day-by-day summation of the major events of the campaign, see Anthony H. Cordesman, *The Iraq
War: Strategy, Tactics, and Military Lessons* (Washington: Center for Strategic and International Studies
Press, 2003), 60-144.

[7] Miseli, 11-12. "Slant" is Army shorthand for combat power. In other words, it denotes the
particular count of various key types of equipment the unit has available and/or operational. It derives from
the practice of writing the number on-hand and the number available with a slash or "slant" between them.

[8] Miseli, 12.

[9] High Mobility Multi-Purpose Wheeled Vehicle. Also referred to as "Humvee."

[10] Miseli, 12.

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This is hardly the picture of a force well-postured to continue major combat operations should it have been necessary. But was the experience of this task force typical? It certainly seems to have been. The AAR for the 10th Engineer Battalion, part of the 3ID's 2d BCT, states, "The supply system failed completely in providing . . . [a] supply of class IX repair parts both before and during OIF." Elsewhere in the AAR, the unit reports that "When the battalion was forced to move decentralized over a 500 km attack . . . , we suffered more than [a] 50% attrition rate with AVLBs [Armored Vehicle Launched Bridges] and ACEs [Armored Combat Earthmovers]." The report states that due to the lack of repair parts for these vehicles, "had we had a significant mission requirement for AVLBs and ACEs, we would have failed to accomplish that mission."[11]

Nor was the lack of repair parts confined to tracked and armored vehicles. The 1st Battalion, 3d Aviation Regiment, the 3ID's attack helicopter battalion, reported in their AAR that critical HMMWV parts took more than two months to arrive. The review states that, "There was a severe shortage of HMMWV class IX ground parts in theater . . . [that] significantly reduced the readiness of the fleet. Demand for these parts far exceeded supply. Given our current MTOEs[12] and lack of internal lift assets, it is absolutely critical that all vehicles in the unit be available for combat."[13]

The 3ID's OIF AAR provides a further example of the looming problems the division faced by mid-April due to inadequate resupply. In a paragraph addressing the (non-) availability of critical communications parts and batteries (which are also Class IX items), the AAR states "certain batteries ran critically low. Battery resupplies were isolated events and barely sustained

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[11] 10th Engineer Battalion, "Operation IRAQI FREEDOM 10th EN BN After Action Review," OIF Study Group, 23 April 2003, 5-6.
[12] Modification Table of Organization and Equipment, the document that prescribes a unit's allocation of personnel and equipment.
[13] 1st Battalion, 3d Aviation, "1-3 Avn After Action Review," OIF Study Group, 30 April 2003, 26 and 30.

units through the transition to stability and support operations (SASO). It would not have been possible to sustain operations beyond transition without a significant resupply."[14]

The lack of spare parts did not merely result in the *temporary* loss of vehicles, either. In 1-64 Armor, "During the initial running start, the unit lost one M1 tank quickly after it sheared off three road wheels and the unit did not have the parts to perform repairs. The tank was cannibalized for parts needed to repair other tanks. During the move forward, as a vehicle was rendered unrepairable, track or wheel, it too was stripped for parts needed to repair other vehicles."[15] While such cannibalization was one of the few means by which units were able to repair other vehicles, it is hardly the preferred means of sustaining combat power, particularly when the cannibalized vehicle is one that, with the proper spare parts, could be restored to operational condition within days or even hours. Unfortunately, it was a very common fate of vehicles that broke down and had to be left behind. Anything not cannibalized by the owning unit was stripped for parts by other units or the Iraqi populace. As described by the commander of the Division Support Command, 101st Airborne Division, "Vehicles abandoned for flat tires and lack of transportation assets were completely lost due to stripping. Units cannot afford to leave a guard with broken down vehicles."[16] The 3ID's 1st BCT reported having to abandon "nearly five percent of BCT and attached equipment."[17]

In 4-64 Armor, "During the movement north, the unit did not receive any repair parts through the supply system. Tank crews had to use degraded systems due to the lack of repair parts to fix items such as the turret traversing system on tanks. In some cases, crews had to manually

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[14] 3d Infantry Division, "Third Infantry Division (Mechanized) After Action Report – Operation Iraqi Freedom," 2003, 202.

[15] CW4 Michael Campbell, "CW2 Roger Guillemette, et al., interview, Battalion Maintenance Technician, Officer, and NCO, 1/64 Armor Battalion," OIF Study Group, 20 May 2003.

[16] CW4 Michael Campbell, "COL Rogers interview, Commander, 101st ABN DIV DISCOM," OIF Study Group, 22 May 2003.

[17] 1st Brigade Combat Team, 3d Infantry Division,"Combat Operations Lessons Learned," OIF Study Group, nd, 22.

traverse the turret to fire."[18] On 15 May 2003, the commander of 2-7 Infantry reported that his unit had not received a single repair part since entering Iraq, except for what they had taken from damaged vehicles or borrowed from other units.[19] On the 20th of May, 3-15 Infantry had "not received any repair parts since 10 March," a period of over two months.[20] And finally, lest anyone think that non-divisional units were somehow faring better, the S4 of the 2d Squadron, 2d Cavalry Regiment reported on 14 May 2003 that "Repair parts were not coming in. [The unit] did not receive any CL IX through the proper supply system."[21]

Thus, the evidence seems clear that the Class IX supply system was not functioning as it should have for the frontline units in Operation Iraqi Freedom. What is not clear from the above examples is where the problem(s) lay. The Class IX supply system is a system of systems. Problems at key points in any one of those individual sub-systems can potentially cause significant degradation to the effectiveness of the overall system. To understand the Class IX problems in OIF we must first know how the sub-systems are supposed to work, and then examine how they actually worked during the war.

Research question, scope, and methodology

This monograph will attempt to determine whether the Army's doctrine for Class IX supply operations needs to be revised in light of OIF experience. Chapter 2 examines the Army's current Class IX supply doctrine. Chapter 3 examines what actually took place with Class IX supply operations during OIF and investigates the cause(s) of the apparent shortcomings. In Chapter 4, the actual events are compared to doctrine. Finally, Chapter 5 recommends changes to doctrine and/or other procedures to improve the Army's Class IX supply system.

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[18] CW4 Michael Campbell, "CPT Scott Thompson interview, Battalion Maintenance Officer, 4/64 Armor Battalion," OIF Study Group, 20 May 2003.

[19] Colonel Timothy Cherry and Major David Tallman, "LTC Scott Rutter interview, Commander, 2-7 Infantry," 15 May 2003, 8.

[20] CW4 Michael Campbell, "CPT William Marm interview, Battalion Maintenance Officer, 3/15 Infantry Battalion," OIF Study Group, 20 May 2003.

[21] Major Demitrius L. Jackson, "CPT Brian Mike Mescall interview, Squadron S-4, 2D ACR," OIF Study Group, 14 May 2003.

As general criteria for assessing whether a particular aspect of doctrine needs to be changed, this monograph uses the principles of distribution listed in U.S. Army Field Manual (FM) 100-10-1, *Theater Distribution*, and Joint Publication (JP) 4-01.4, *Joint Tactics, Techniques, and Procedures for Joint Theater Distribution.* FM 100-10-1 lists five principles of distribution: centralize management, optimize infrastructure, maximize [use of] throughput, minimize forward stockpiling, and maintain continuous and seamless pipeline flow.[22] JP 4-01.4 lists these same five principles and adds three more: velocity over mass, reduce customer wait time, and achieve time-definite delivery.[23]

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[22] U.S. Department of the Army, FM 100-10-1, *Theater Distribution* (Washington, 1999), 3-4 to 3-5.

[23] U.S. Department of Defense, JP 4-01.4*, Joint Tactics, Techniques, and Procedures for Joint Theater Distribution* (Washington, 2000), I-7 to I-8.

CHAPTER TWO

CURRENT CLASS IX SUPPLY DOCTRINE

Over the past decade, the US Army has transitioned from a supply-based to a distribution-based logistics system.[24] The term "supply-based logistics" refers to a system that relies on large, decentralized stockpiles of supplies, each of which essentially "belongs" to one particular organization or element. "Distribution-based logistics," on the other hand, describes a system in which smaller, more centralized stockpiles can be used to supply numerous, geographically dispersed organizations by leveraging modern transportation means combined with automated information systems.[25] As described by the commander of the Defense Logistics Agency (DLA) in 1999, "Logistics has changed from a supply-based system relying on large stockpiles to a quickly developing web-enabled distribution system that exploits advances in commercial information systems to gain total asset visibility and to improve management of the entire supply chain. DLA's focus is shifting from managing inventories to managing information across the supply chain; from managing supplies to managing suppliers; and from buying inventory to buying response time."[26]

Since the above quote is from the commander of a DOD agency rather than an Army agency, it should be evident that distribution-based logistics is not just an Army initiative. In fact, it is very much a Joint concept. *Joint Vision 2010* lists "Focused Logistics" as one of four "emerging operational concepts" that will "provide our forces with a new conceptual framework."[27] It goes on to define focused logistics as "the fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets even while

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[24] Lieutenant Colonel Joseph L. Walden, "A Velocity Management Update," *Army Logistician,* March-April 1999, 5.
[25] FM 100-10-1, 3-1.
[26] Lieutenant General Henry T. Glisson, "Revolution in Military Logistics—Improving Support to the Warfighter," Army Logistician, January-February 1999, 8.
[27] U.S. Department of Defense, *Joint Vision 2010* (Washington, nd), 19; available from http://www.dtic.mil/jv2010/jvpub.htm; Internet; accessed 6 March 2004. The other three "emerging operational concepts" are dominant maneuver, precision engagement, and full-dimensional protection.

enroute, and to deliver tailored logistics packages and sustainment directly at the strategic, operational, and tactical level of operations."[28] Clearly, distribution-based logistics and focused logistics are essentially the same concept.

Fundamental Principles of Distribution

The Department of Defense's *Dictionary of Military Terms* defines distribution as "the operational process of synchronizing all elements of the logistic system to deliver the 'right things' to the 'right place' at the 'right time' to support the geographic combatant commander."[29] JP 4-01.4*, Joint Tactics, Techniques, and Procedures for Joint Theater Distribution*, lists eight fundamental, interrelated principles of distribution: centralized management, optimized infrastructure, velocity over mass, maximized [use of] throughput, reduced customer wait times, maintenance of minimum essential stocks, maintenance of continuous, seamless pipeline flow, and achievement of time-definite delivery.[30]

Centralized management "involves the integrated end-to-end visibility, capacity, and control of the distribution system capacity and distribution pipeline flow."[31] The Army is adding distribution management centers/elements (DMC/Es) to support commands at each echelon to perform this centralized management of the distribution process.[32]

Optimized infrastructure depends on the ability of "distribution managers at each echelon to maintain visibility of the infrastructure under their control, and to acquire or reallocate physical network capabilities to meet changing requirements."[33] (*Physical network capabilities* refers to

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[28] Department of Defense, *Joint Vision 2010,* 24.
[29] U.S. Department of Defense, JP 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, 2001), 135.
[30] JP 4-01.4, I-7 to I-8. As mentioned in Chapter 1, FM 100-10-1, *Theater Distribution,* lists five of these as Army principles of distribution. The three it omits are velocity over mass, reduced customer wait times, and achievement of time-definite delivery.
[31] Ibid., I-7.
[32] U.S. Department of the Army, FM 4-0, *Combat Service Support* (Washington, 2003), 1-10; FM 100-10-1, 3-4 to 3-5.
[33] JP 4-01.4, I-7.

such resources as roads, railroads, ports, pipelines, materiel handling equipment (MHE), and the personnel to operate them.)[34]

Velocity over mass refers to the replacement of large resource stockpiles (mass) by fast and accurate delivery of resources (velocity).

Throughput distribution refers to distribution that "bypasses one or more echelons in the supply system to minimize handling and speed delivery forward."[35] Maximizing the use of such bypassing reduces the number of times that materiel "must be processed, configured, or reconfigured," and thus "directly improves the velocity of material distribution and decreases resource requirements."[36] Throughput distribution is aided by the use of containerization, and is closely related to the concept of configured loads.

A configured load is "a single or multi-commodity load of supplies built to the anticipated or actual needs of a consuming unit, thereby facilitating throughput to the lowest possible echelon."[37] By preparing containers or pallets so that they contain supplies destined for a single customer support activity, higher level providers avoid the need for intermediate echelons to reconfigure the loads on their way to their ultimate destination. This maximizes velocity and the ability to use throughput distribution.

Reduced customer wait times result from velocity over mass, which in turn is a product of centralized management, optimized infrastructure, and maximized use of throughput. Customer Wait Time (CWT) is "the total time elapsed between the issuance of a customer order and satisfaction of that order."[38] CWT starts when a requirement is created in a unit level supply automation system and stops when that same system acknowledges receipt of the required item. In December 2000, CWT replaced Order Ship Time (OST) as the Army's official performance

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[34] Ibid., I-8.
[35] FM 100-10-1, 3-5.
[36] JP 4-01.4, I-7.
[37] FM 4-0, 1-11.
[38] U.S. Army Combined Arms Support Command, *An Army Model for Understanding, Managing, and Improving Customer Wait Time Performance* (Washington, nd), 1; available from http://www.cascom.army.mil/adm; Internet; accessed 19 March 2004.

metric for supply transactions. OST measured the response time needed for the wholesale supply system to satisfy requisitions placed by the retail supply system, but did not account for customer requests satisfied entirely at the retail level.[39]

The ability to *maintain* only *minimum essential stocks* results from the "velocity of a distribution-based logistic system," and "reduces the reliance on large, costly stockpiles within a theater."[40] Under this principle, "pre-positioned afloat and theater land-based essential sustainment stocks" are used to provide "minimum essential stocks required to begin operations in a theater and augment the distribution pipeline."[41] Because of the efficiency and velocity of the distribution system, the theater commander should be able to have confidence that he can rely on the system to provide additional stocks in time to meet his requirements.

Maintenance of continuous, seamless pipeline flow results from applying all the other distribution principles. As described by JP 4-01.4, "The integrated logistic and command and control (C2) communications networks of the distribution system provide the . . . connectivity that creates a distribution management structure, the capability to maintain continuous and seamless distribution pipeline flow, and the visibility of the materiel within."[42]

Achievement of time-definite delivery. JP 1-02 defines time-definite delivery (TDD) as "the delivery of requested logistic support at a time and destination specified by the receiving activity."[43] The consistent achievement of TDD provides the confidence in the logistics system

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[39] U.S. Army CASCOM, *An Army Model forUnderstanding . . . Customer Wait Time Performance,* 1-2. Wholesale level supply support includes such activities as national inventory control points, depots, arsenals, plants, and factories. The wholesale system procures supplies from commercial sources and government plants, and distributes them to the retail level for stockage or issue. The retail level of supply encompasses everything below the wholesale level, including installation supply and maintenance organizations, general support organizations, and direct support organizations. See Department of the Army, Army Regulation (AR) 710-2, *Inventory Management Supply Policy Below the Wholesale Level* (Washington: 31 October 1997), 193 and 195 (Glossary).
[40] JP 4-01.4, I-7.
[41] Ibid.
[42] Ibid., I-8.
[43] JP 1-02, 441.

necessary to "eliminate . . . the stockpiled stores which have characterized past logistic operations."[44]

Velocity Management

In January 1995, the Army initiated a program called Velocity Management (VM) that encompassed the concepts involved in a distribution-based logistics system.[45] Specifically, it aimed to "replace mass with velocity and stockpiles of supplies with reduced order ship times."[46] Initially, it focused only on Class IX management, although it later expanded to other areas. As described by FM 4-0, VM is "an Army-wide total quality management process-improvement program," and "strives to provide world-class logistics support . . . by leveraging information technologies and optimizing [logistics] processes."[47] VM uses a variety of management tools, automation systems, and other advanced technology as process enablers.

Within the first few years of its existence, the VM program led to some dramatic improvements in the ordering and shipping process for repair parts. For example, by September 1998, the program had produced more than a 50 percent reduction in order ship times (OST) for active duty units in the continental U.S. (CONUS). For some large CONUS installations that were among the first to participate in the program, improvements were even greater. For example, the median OST for Fort Bragg, North Carolina, declined by 67 percent over the same period. Although the program started later for units outside CONUS (OCONUS), by September 1998,

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[44] JP 4-01.4, I-8.

[45] Thomas J. Edwards and Dr. Rick Eden, "Velocity Management and the Revolution in Military Logistics," *Army Logistician,* January-February 1999, 54.

[46] Lieutenant Colonel Joseph L. Walden, "A Velocity Management Update," *Army Logistician,* March-April 1999, 5.

[47] FM 4-0, 1-12. The VM program was renamed the Army Distribution Management (ADM) program on 1 January 2003 and given a somewhat wider focus. See "Distribution Management Picks Up Where Velocity Management Leaves Off," Army Logistician, March-April 2003, 1. Although published after that date, FM 4-0 still refers to it as the VM program.

mean OSTs for shipments by air from CONUS depots to U.S. Army Europe units had improved

by 29 percent. The corresponding improvement for units in Korea was 50 percent.[48]

Changes to Repair Parts Supply Policy under Velocity Management

The improvements in Class IX OSTs produced by the VM program allowed the Army to

proceed with the other part of the VM program: reducing stockpiles of spare parts in units. These

unit level stockpiles are divided into two categories: Prescribed Load Lists (PLL) and Authorized

Stockage Lists (ASL). PLL refers to those repair parts authorized to be stocked at unit (company

and battalion) level for maintenance of the unit's own equipment. ASL repair parts are stocked by

maintenance units both for their own use and for issue to the units they support.[49]

Pre-VM PLL Policy

When VM was introduced in 1995, PLL policy was governed by the 28 February 1994

edition of Army Regulation (AR) 710-2, *Inventory Management Supply Policy Below the

Wholesale Level.*[50] There were (and are) three generic categories of PLL repair parts: demand

supported, non-demand supported, and initial stockage. For most units, PLL was limited to 300

lines. (A "line" is one particular item, regardless of quantity. For example, a HMMWV starter

would count as one line, whether a particular unit was authorized to stock one or twenty.) Certain

specialized units were exempted from the 300 line limit, and there were certain loopholes by

which "normal" units could also get permission to exceed 300 lines.[51]

Demand supported parts are those that meet certain criteria for number of demands

within a certain time span. Under the 1994 version of AR 710-2, the basic requirement to add a

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[48] Edwards and Eden, 54-55.

[49] For a detailed discussion of the PLL and ASL changes discussed here, see Ira D. Crytzer, "Changing Repair Parts Supply Policy," *Army Logistician,* March-April 1999, 8-11.

[50] Basic PLL and ASL policy was governed by U.S. Department of the Army, Army Regulation (AR) 710-2, *Inventory Management Supply Policy Below the Wholesale Level.* Chapter 2 covered PLL policy and Chapter 3 covered ASLs. The most recent version of the regulation at the time of OIF was dated 31 October 1997. At the time of this writing, it has just been republished as AR 710-2, *Supply Policy Below the National Level,* dated 25 February 2004.

[51] AR 710-2, 31 October 1997, 24-25.

new part to PLL was that it have three demands within the "control period" (defined as 180 days for active duty units and 360 days for reserve component units). Thereafter, to retain a demand supported item on PLL, it needed to have at least one demand during the most recent control period. Parts that failed to meet that requirement would be dropped from the unit's PLL. The actual quantity of a particular demand supported item to be stocked was based on the number of demands within a certain period and a generic "Average Customer Wait Time" (ACWT), either 10 or 15 days. Major Army commands (MACOMs) were authorized to select the ACWT for their subordinate units, "based upon a representative sample of wait times within their commands."[52] The longer the ACWT selected, the more of a given item would be stocked.

Non-demand supported items required approval by the first general officer staff level in a unit's chain of command. There was no limitation on the number of non-demand supported lines a unit could have, as long as it didn't exceed the overall limit of 300 lines.

Initial-issue parts are those initially issued with newly fielded equipment. Under the 1994 rules, they could provide justification for exceeding the 300-line limit, but they transitioned to being demand-supported items over a two-year period.

PLL Policy Changes under VM

On 7 July 1997, the Army Deputy Chief of Staff for Logistics (DCSLOG) released a policy message modifying the PLL policy in AR 710-2. The criteria for demand-supported items were made significantly more stringent. Nine demands within the control period were now required to add an item, compared to three demands under the previous policy. To retain an item, six demands were now required within a control period, compared to the previous requirement of only one demand. Non-demand supported items were limited to 15 lines, although they now only required the approval of the unit commander. For most units, initial-issue repair parts were

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[52] Ibid., 24.

eliminated from PLL and were now to be stocked no lower than the ASL. And finally, total PLL lines were limited to 150 for most units.[53]

The overall effect of the modified policy was to significantly reduce unit PLL stocks across the Army. Not only was the overall line limit halved, but the new demand requirements also made it far harder for a particular repair part to qualify as demand supported. There were distinct positive aspects to this reduction. Beyond the direct cost saving due to far smaller repair parts stockpiles, there was the reduced management burden on units and the reduction in transportation assets needed to move PLLs to the field. And, for the most part, operational readiness rates did not seem to be affected by the change. As described in 1999 by one of the authors of the new PLL policy, "PLLs today are smaller, lighter, and more deployable than they have ever been. Being much more demand-supported in nature, they reflect the true needs of the unit without the 'comfort zone' of extra parts in the bin. Although the field is still not completely comfortable with these changes, the fact that equipment readiness rates remain at very high levels indicates that the Army can rely on velocity management to maintain readiness while spending less money on repair parts at the unit level."[54]

However, this view was not unanimous within the Army, particularly at unit level. As pointed out by one letter-writer to *Army Logistician*, the apparently unchanged operational readiness (OR) rates under the new system were often being achieved by scrounging parts, by units maintaining unofficial "nest eggs" of parts, or by other "outside the system" methods. Not only did this waste significant man-hours that key maintenance personnel could have devoted to other tasks, but it also skewed the data on how well the new policies were working. As the letter-

[53] Department of the Army, DCSLOG Message DALO-ZA 071849Z JUL 97, *Retail Supply Policy Changes* (Washington: 7 July 1997); available from https://lia13-www.army.mil/dpmsh/interim_index.htm; Internet; accessed 13 March 2004. See also Crytzer, "Changing Repair Parts Supply Policy," 9. Interestingly, when the Army published a new edition of AR 710-2 in October 1997, (i.e., *after* the July 1997 DCSLOG message), the new AR retained the PLL policies of the 1994 edition. However, the changes of the July 1997 DCSLOG message continued to be in effect. See AR 710-2, 31 October 1997, 24-25.
[54] Crytzer, "Changing Repair Parts Supply Policy," 9. Mr. Crytzer is listed as one of two points of contact for the 7 July 1997 DCSLOG message.

writer summed it up, "Just because the numbers remain high does not mean the system is working. It may mean we have been forced to find alternatives that not everyone will admit to."[55]

In reaction to such concerns, the Army DCSLOG published a message on 14 February 2001 that somewhat relaxed the 1997 restrictions on PLL. (The first paragraph of the message contained the statement that "Recent comments from the field have indicated that [the] current policy is too restrictive and impacts field maintenance operations and efficiencies.") MACOMs were now authorized to allow subordinate units to reduce stockage criteria to six demands for adding an item (down from nine) and three demands to retain an item (down from six) on PLL. Initial stockage of parts for newly introduced equipment was also reintroduced into PLL. The other rules from the 1997 message remained in effect, including the overall PLL limit of 150 lines.[56]

Basic ASL Policy

Basic Authorized Stockage List policy is governed by Chapter 3 of AR 710-2. Like PLL, ASL has demand-supported, non-demand-supported and initial-issue parts, although the precise terms differ somewhat. Stockage criteria also function similarly to those for PLL. Normal demand-supported items require nine demands within a 360-day period to add to ASL, and three demands in 360 days to retain. Command-designated items only require three demands to add and one to retain. Certain initial-issue parts for newly issued equipment are authorized to be kept on ASL for up to two years, to allow a demand history to be built.[57]

The October 1997 edition of AR 710-2 allowed for three different methods of computing the stockage level or requisition objective (RO) for a particular item. These were referred to as the days of supply (DOS), economic order quantity (EOQ), and readiness based sparing (RBS)

[55] Chief Warrant Officer 2 Al Smith, "Readiness Rates and Supply Policy" [letter], *Army Logistician,* July-August 1999, 2.

[56] Department of the Army, DCSLOG Message DALO-ZA 141153Z FEB 01, *Interim Prescribed Load List (PLL) Policy* (Washington: 14 February 2001); available from https://lia13-www.army.mil/dpmsh/interim_index.htm; Internet; accessed 13 March 2004.

[57] AR 710-2, 31 October 1997, 42-43.

methods. The DOS method was the Army's traditional method of determining stockage methods.[58] Under the DOS method, the RO was based the sum of three numbers, all of which are based on a proportion of the total number of demands per 360 days. The first of these numbers, referred to as the Operating Level (OL), is the number of demands expected in an arbitrary time period. AR 710-2 set this time period at 15 days for CONUS-based units and 30 days for OCONUS units. The second number, referred to as the Order Ship Time (OST) Level, is the theoretical quantity of the part that would be in the resupply pipeline at any given time. It is based on the average time (in days) between requisition and receipt of that particular part over the previous 360 days. Note that as the OST declines, the number of items stocked will also decline. The third number is a safety cushion referred to as the Safety Level (SL). It is simply an additional 5 days' (CONUS) or 15 days' (OCONUS) worth of parts to make up for any potential interruptions or delays in the supply pipeline.[59]

In summary, under the DOS method, CONUS-based ASLs were authorized a maximum of 20 days of supply (DOS) (15 days OL plus five days SL), plus whatever the OST (pipeline) level was for that part (typically about 6 days' worth). OCONUS ASLs were authorized a maximum of 45 DOS (30 days OL plus 15 days SL), plus their OST level (typically around 20 days).[60]

The other two methods of computing ASL stockage under the 1997 AR 710-2 were essentially ways of making the process more "scientific" (and therefore, efficient) by taking advantage of the analytical power of modern automation systems. The economic order quantity method was still demand based, but added unit price, ordering costs, and storage costs (i.e., item size and weight) into the equation.[61] Essentially, it led to the replenishment of larger quantities of low-dollar value items while replenishing smaller quantities of more expensive items. The third

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[58] Crytzer, 9.
[59] AR 710-2, 31 October 1997, 43. See also Crytzer, 9-10.
[60] Crytzer, 9-10.
[61] Ibid., 11.

method, readiness based sparing, was designed to "compute stockage levels for all critical combat weapons system using ILAP [Integrated Logistics Analysis Program] and Optimum Stockage Analysis Requirement Program (OSRAP)."[62]

ASL Changes under VM

Although not a change to ASL policy as such, the improvements to OST caused by the VM program had the natural effect of reducing stockage levels by reducing the OST portion of the RO equation. One study of four CONUS-based active component divisions showed that from December 1994 to December 1999, their total (combined) ASL RO levels dropped from $151.6 million to $107.7 million, while the value of inventory actually on hand went from $99 million to $75 million. This was about a 30 percent reduction in ASL requirements and a 25 percent reduction in on-hand assets.[63]

In October 2000, DCSLOG introduced another option for computing stockage levels. Called the dollar-cost banding (DCB) method, it divided items into "bands" based on cost. In place of the one-size-fits-all stockage criteria in AR 710-2, DCB established graduated criteria for the various cost bands, with less expensive parts being easier to stock.[64] When tested in the 101st Airborne Division (Air Assault), in combination with "a conscious decision to stock fewer high-cost parts and more low-cost parts," DCB resulted in a 50-percent reduction (to $9 million) in the dollar value of the division's ASL.[65] Such drastic reductions in ASL levels caused some observers to begin to question whether they would still be sufficient to sustain units during the early days of combat or other contingency operations.[66]

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[62] AR 710-2, 31 October 1997, 43.

[63] Thomas R. Welch, "An Argument for a Combat ASL," *Army Logistician,* July-August 1999.

[64] Department of the Army, DCSLOG Message DALO-ZA 120946Z OCT 00, *HQDA Dollar Cost Banding (DCB) Policy* (Washington: 12 October 2000); available from https://lia13-www.army.mil/dpmsh/interim_index.htm; Internet; accessed 13 March 2004.

[65] Welch, 48.

[66] Ibid., for example.

The Distribution Pipeline

JP 4-01.4 describes the distribution pipeline as "The end-to-end flow of resources from supplier to point of consumption, and in some cases back to the supplier in retrograde activities necessary to recycle repairable . . . assets." It goes on to say that from the supported combatant commander's perspective, "the distribution pipeline is divided into two portions; *strategic* and *theater*."[67]

The strategic portion of the pipeline has two distinct functional areas. The first of these, performed by the Defense Logistics Agency (DLA) and other national providers, includes such things as acquisition, materiel management, total asset visibility (TAV), and other traditional supply functions. The second function, largely performed by the U.S. Transportation Command (USTRANSCOM), deals with strategic lift and in-transit visibility (ITV). In broad terms, this function entails moving assets from their point of origin to a port of embarkation (POE) (which can be either an air or sea port), and then on to a port of debarkation (POD) in a theater of operations.[68]

The theater portion of the distribution pipeline is the responsibility of the supported geographic combatant commander. It begins at the POD and extends to the end user. The theater distribution system "consists of physical, financial, information, and communication networks."[69] It can be subdivided into operational and tactical portions. In Army terms, operational distribution generally means everything within the theater above corps level, while tactical distribution refers to anything at corps level or below.

Strategic Distribution Pipeline I – The Defense Logistics Agency

DLA provides worldwide distribution support to all elements of the Department of Defense. It manages or distributes over 80-percent of defense materiel, to include distribution of

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[67] JP 4-01.4, I-1.
[68] Ibid., I-2.
[69] Ibid., I-2 and IV-1.

service owned and managed stocks, including most repair parts."[70] It also serves as the lead organization within DOD for automatic identification technology (AIT).[71]

The Defense Distribution Center (DDC), a primary field-level activity of DLA, operates a network of defense distribution depots throughout the world. Most of these are in CONUS, although a few are located overseas. Two of the defense distribution depots serve as Primary Distribution Sites (PDSs). These are Defense Depot San Joaquin, California, and Defense Depot Susquehanna, Pennsylvania. San Joaquin primarily supports customers in the Pacific, while Susquehanna handles all other areas. Both of these PDSs operate Consolidation and Containerization Points (CCPs). These CCPs receive materiel from a variety of sources (other DDC depots, prime vendors, the General Services Administration (GSA), and other government supply sources) and consolidate them into pallets and containers for air and surface shipment.[72]

Strategic Distribution Pipeline II – US Transportation Command

The second segment of the strategic distribution pipeline consists of the Defense Transportation System, managed by the U.S. Transportation Command. USTRANSCOM is a unified command that serves as the DOD's single manager for transportation. It controls three service component commands: the Army's Military Traffic Management Command (MTMC)[73], the Air Force's Air Mobility Command (AMC), and the Navy's Military Sealift Command (MSC). In addition to the physical transportation of assets, USTRANSCOM is responsible for tracking the in-transit status of assets within its segment of the pipeline.[74]

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[70] U.S. Department of Defense, JP 4-09, *Joint Doctrine for Global Distribution* (Washington, 2001), II-13.
[71] JP 4-01.4, II-5.
[72] JP 4-09, V-2 to V-3.
[73] MTMC was actually renamed Surface Deployment and Distribution Command (SDDC) on 1 January 2004. Since its name was still MTMC during the initial phases of OIF, I will use that name here.
[74] JP 4-01.4, IV-1 to IV-4.

Theater Distribution – The Operational Level

Once a shipment arrives at a POD, it moves from the strategic distribution pipeline into the theater distribution pipeline.[75] As mentioned earlier, theater distribution is subdivided into operational and tactical levels.

For the Army, the operational portion of the pipeline is the responsibility of a Theater Support Command (TSC). FM 4-93.4, *Theater Support Command,* describes a TSC as "a multifunctional support headquarters . . . that works at the operational level with links to strategic- and tactical-level support organizations and agencies."[76]

TSCs are flexible organizations designed to be tailored to the needs of their particular theater, so no two are exactly alike. However, under current doctrine, all TSCs are supposed to have an organic distribution management center (DMC). The DMC "provides staff supervision over the TSC materiel management center (MMC) and movement control agency (MCA)."[77] In addition, certain specialized subordinate organizations are routinely assigned or attached to a TSC. These include such organizations as an Ammunition Group, a Petroleum Group, and one or more Area Support Groups (ASG). In large theaters, the TSC may also be given control of certain specialized commands including the theater transportation command (TRANSCOM).[78] While all of these subordinate elements have a role in the distribution pipeline, the most significant of them from a Class IX standpoint are the TRANSCOM and the ASG(s) (and, of course, the DMC).

Area Support Groups are subordinate elements of the TSC that are responsible for providing direct support (DS) logistic support to units either stationed in or passing through a particular area of operations (AO). ASGs are designed to be task organized for their particular

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[75] A theater is "a geographical area outside the continental United States for which a geographic combatant commander is assigned military responsibility." U.S. Department of the Army, FM 4-93.4, *Theater Support Command* (Washington, 2003), 1-1.

[76] FM 4-93.4, 2-2.

[77] Ibid., 2-11. *Organic,* in this sense, refers to a subordinate element that is a permanent part of some higher level organization.

[78] Ibid., 2-18 to 2-28.

AO and mission, with a mix of specialized and multi-functional units.[79] Typically, these will include a supply and service (S&S) battalion and some mix of direct support (DS) maintenance battalions and companies. The S&S battalion may include a repair parts supply company whose mission is to receive, store, and issue Class IX items. The number and type of DS maintenance companies varies with the situation. Their mission is to provide DS maintenance, including repair parts supply, to the other elements of the ASG, as well as other units operating within or passing through the TSC's AO.[80]

Theater Distribution – The Tactical Level

As mentioned previously, the tactical level usually means everything from corps level on down.

Corps Level Support Structure

At the corps level, the primary support organization is the Corps Support Command (COSCOM), allocated one per corps. The main distribution-related subordinate elements of a COSCOM are functional control centers (materiel management and movement control centers) and a variable number of corps support groups (CSGs). If the COSCOM has three or more transportation battalions assigned or attached, it may also have a transportation group headquarters attached to control them.[81]

The functional control groups are the Corps Materiel Management Center (CMMC) and the Corps Movement Control Center (CMCC). The CMMC provides centralized management over supply and maintenance operations, while the CMCC provides centralized movement and highway regulation.[82]

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[79] Specialized, or functionally organized, units are those that perform a single basic function, e.g., supply, transportation, or maintenance. Multi-functional units are those with a mixture of subordinate units with various functions.

[80] FM 4-93.4, 2-28 to 2-31.

[81] U.S. Department of the Army, FM 63-3, *Corps Support Command* (Washington, 1993), 1-17.

[82] Ibid.

Corps Support Groups are of two types: forward and rear. There is one Rear CSG per COSCOM, while the Forward CSGs are allocated on the basis of one per division. Both types of CSGs are designed to be tailored for their particular mission and supported unit. Forward CSGs normally contain two or more multi-functional Corps Support Battalions (CSBs). These battalions have no fixed organization, but can be task organized with a variety of different company-size CSS units. One of the CSBs in a CSG normally operates forward of the division rear boundary, providing support to non-divisional units (corps artillery, for example) operating within the division's area. They can also provide reinforcing support to divisional units when required. The subordinate companies of this battalion are all direct support (DS) units: supply, maintenance, ordnance, transportation, and the like.[83] Typically, one of these CSBs operating within a division area might have a DS maintenance company, a DS supply company, a DS ammunition company, a field services company, and one or two truck companies.[84]

The remaining CSB(s) in a CSG operate behind the division rear boundary. They can contain both direct support and general support (GS) level units. These units provide support to units in their designated area of responsibility, and, in addition, "provide GS supply, reinforcing maintenance, and field service support" to the division or other major combat elements.[85]

As mentioned above, each COSCOM has one Rear CSG. Its mission is to support the corps as a whole and provide reinforcing support to the forward CSGs. It is composed of a variety of functional battalions which support the whole corps, and one or more multi-functional CSBs that provide direct support to units operating in the Rear CSG's area. Typical functional battalions include supply and services, ammunition, petroleum supply, and transportation. The rear CSG normally also has an aviation intermediate maintenance battalion and may have a water supply battalion.

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[83] Ibid., 1-17 to 1-20.
[84] Department of the Army, FM 4-30.3, *Maintenance Operations and Procedures* (Washington, 2000), 2-32.
[85] FM 63-3, 1-20.

Division Level and Below

Each division has a Division Support Command (DISCOM). These vary somewhat in structure depending on the type of division they belong to, but all follow the same general pattern.[86] In the heavy division (armored or mechanized infantry), the DISCOM is organized with a Materiel Management Center (MMC), a Main Support Battalion (MSB), three Forward Support Battalions (FSBs), and an Aviation Support Battalion (ASB). Similarly to the MMC at corps level, the division MMC provides centralized management of supply and maintenance operations for the division. The FSBs each support one of the division's three maneuver brigades, while the ASB supports the aviation brigade. The MSB provides DS-level support to units in the division rear area and reinforcing support to the FSBs and ASB.[87]

The elements of the heavy division MSB that play a role in Class IX distribution are the heavy (or main) maintenance company, the electronic maintenance company, and the transportation motor transport (TMT) company. The heavy maintenance company provides DS-level conventional maintenance to any divisional units not supported by an FSB or ASB. It also provides backup support to the FSBs, except for repair parts supply. As its name implies, the electronic maintenance company provides DS-level maintenance support of electronic systems such as communications, missile, and night-vision systems. It also has the mission of providing Class IX supply support for all division-supported units. To do this, it maintains an ASL of

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[86] For a description of the major features of the DISCOM in light, airborne, and air assault divisions, see FM 4-30.3, pages 2-55, 2-61, and 2-68, respectively.

[87] FM 4-30.3, 2-39 to 2-41. Note that the DISCOM described here is for the so-called "Army of Excellence" (AOE) MTOE, which included most of the Army's heavy divisions at the start of OIF. The DISCOM organization under the newer "Force XXI" division MTOE is somewhat different. Many of the changes are designed to make the DISCOM a more "distribution-based" organization. For a good summary of the changes to the DISCOM and its subordinate elements under Force XXI, see FM 4-30.4, pages 2-41, 2-47, 2-51, and 2-54. At the start of OIF, the 4th Infantry and 1st Cavalry Divisions were organized under the Force XXI MTOE.

approximately 6000 lines.[88] The TMT company provides trucks to move supplies (including

Class IX) from the MSB to the FSBs.

The heavy FSB is organized with a supply, a maintenance, and a medical company. The

maintenance company provides DS-level maintenance and repair parts supply support to the units

in its supported brigade or brigade combat team (BCT).[89] To do this, it maintains an ASL of up to

3000 lines. Unlike the MSB, the FSB does not really have significant transportation assets (other

than for bulk fuel) beyond what it needs to move itself.[90]

The division ASB has a ground maintenance and an aircraft maintenance company. The

ground maintenance company provides conventional DS-level maintenance to the aviation

brigade, including the divisional cavalry squadron. It also provides Class IX supply support to the

brigade, for which it maintains an ASL of approximately 6000 lines (4000 aviation and 2000

common). The aircraft maintenance company provides aviation intermediate maintenance

(AVIM) support and backup aviation unit maintenance (AVUM) for the brigade's aviation

units.[91]

Networks of Theater Distribution

JP 4-01.4 describes the theater distribution system as consisting of four "independent and

mutually supporting networks." Specifically, these are the physical, financial, information, and

communications networks.[92]

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[88] Ibid., 2-42 to 2-49. FM 63-21, *Main Support Battalion* (Washington, 1990) also discusses these units, but is somewhat out of date. For example, it describes an older MSB organization in which there were three rather than two maintenance companies in the battalion: heavy, light, and missile support. Under the newer MTOE described in FM 4-30.3, the latter two have been combined into the electronic maintenance company.

[89] A brigade combat team indicates a brigade that has been task organized with various combat support and combat service support elements to make a combined arms team. Typically, this includes an artillery battalion, a combat engineer battalion, and the brigade's habitually associated FSB, along with various smaller elements.

[90] FM 4-30.3, 2-47 to 2-50. See also Department of the Army, FM 63-20, *Forward Support Battalion* (Washington, 1990). Despite its title, FM 63-20 only discusses the heavy division FSB.

[91] Ibid., 2-51 to 2-54.

[92] JP 4-01.4, I-8.

The physical network is composed of all the physical facilities and resources that support the distribution system. This includes such things as roads, railroads, ports, waterways, pipelines, warehouses, and the like. It also includes such resources as personnel and equipment represented by military organizations, commercial entities, or multi-national participants.[93] The military organization portion of the physical network has been outlined above.

The financial network "consists of the policies, processes, and decision systems that obtain, allocate, and apportion the fiscal resources necessary to acquire and maintain distribution capabilities and execute the distribution missions."[94] The financial portion of the distribution system is beyond the scope of this monograph.

The information network is "the synergistic combination of all data collection devices, automatic identification technologies (AITs), automated data and business systems, decision support tools, and asset visibility capabilities supporting or facilitating theater distribution."[95] The most significant of these within the Class IX distribution system will be discussed below.

Finally, the communications network links all the other networks of the distribution system. It carries the data of the information network. Certain aspects of the communications system within the theater will also be discussed below.

The Information Network -- STAMIS

A family of automation systems referred to as Standard Army Management Information Systems (STAMIS) plays the central role in the Army's distribution management system. The most important of the STAMIS systems for Class IX distribution are the Unit Level Logistics System (ULLS), the Standard Army Maintenance System (SAMS), and the Standard Army Retail Supply System (SARRS).

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[93] JP 4-01.4, I-8.
[94] Ibid.
[95] Ibid.

ULLS is used at unit level (company and battalion). Although there are three versions of ULLS, only two of them are used for Class IX management. These are ULLS-G (for "ground") and ULLS-A (for "air"). ULLS-G is found at the organizational maintenance level (i.e., company and battalion). It performs a variety of different maintenance-management functions. Most significantly for Class IX management, it is the system used by organizational maintenance to requisition repair parts, to track the status of those requisitions, and to report the receipt of requisitioned parts. It is also used to manage a unit's PLL. ULLS-A performs similar functions as ULLS-G, but is used specifically for aviation maintenance management. ULLS interfaces with both SAMS and SARSS.[96]

There are two versions of the Standard Army Maintenance System used at the tactical level: SAMS-1 and SAMS-2. SAMS-1 is used by all DS- and GS-level maintenance companies as their primary automated maintenance management system. It performs such time-sensitive tasks as work order and document register management, inventory control, and reordering of stocks. SAMS-1 interfaces with SARSS for automated requisitioning of repair parts needed for work orders.[97]

SAMS-2 is found in the support operations sections of divisional support battalions, in the materiel offices of functional maintenance battalions and support groups at corps and echelons above corps (EAC), and in materiel management centers at all levels. It collects and stores data on equipment performance and maintenance operations. This allows the monitoring of equipment non-mission capable status, determination of critical repair parts and maintenance problem areas, and visibility of maintenance backlogs.[98]

The Standard Army Retail Supply System has three different components: SARSS-1, SARSS-2AD, and SARSS-2AC/B. SARSS-1 is used by supply support activities (SSAs) "at all

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[96] FM 100-10-1, 6-6. For a more detailed summary of ULLS-G's various functions, see FM 4-30.3, 4-16 to 4-23.
[97] Ibid., 6-7. For more information on SAMS-1 functions, see FM 4-30.3, 4-26 to 4-42.
[98] Ibid. For more information on SAMS-2 functions, see FM 4-30.3, 4-42 to 4-44.

echelons to accomplish the receive, store, and issue mission."[99] For example, within a divisional

FSB, the SARSS-1 system for Class IX is located in the maintenance company. SARSS-1

receives repair part requisitions from ULLS and SAMS-1, and passes them to SARSS-2AD.

SARSS-2AD "is the automated supply management system used by managers in MMCs

at the division, separate brigade, or armored cavalry regiment level."[100] It is used to manage

stockage levels and support relationships (i.e., which units are supported by which SSA for a

particular class of supply). It can also be used to manage the lateral distribution of supplies

between SSAs. SARSS-2AC/B performs similar functions as SARSS-2AD, but at corps and

theater-level MMCs.

Two kinds of "address codes" are used with the STAMIS systems: Unit Identification

Codes (UICs) and Department of Defense Activity Address Codes (DODAACs). UICs are more

or less permanent codes that are assigned to each company-sized unit. In general, each company

has only one UIC, although if elements of it are deployed separately, additional "derivative UICs"

are assigned to the separate parts. DODAACs, on the other hand, differ for different classes of

supply, and a given unit will have a number of different DODAACs assigned to it. UICs and

DODAACs are used by STAMIS systems to keep track of assigned support relationships between

units.

The various STAMIS systems described above can communicate with each other through

a variety of means. The preferred means is by way of a local area network (LAN), and then by

way of the internet as required. If a system is not connected to a LAN, an alternate means of

communication is by means of a modem and ordinary telephone lines. In the absence of telephone

or internet connections, there are two alternate means of communication. One of these, referred to

as "FM blasting," involves transmitting the data over ordinary SINCGARS (Single Channel

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[99] Ibid. "Supply Support Activity" is the generic term for an element within a DS or GS unit that issues supplies. For example, within a Forward Support Battalion, the maintenance company runs the battalion's Class IX SSA, while the supply company runs an SSA for various other classes of supply.
[100] Ibid.

Ground and Airborne Radio System) FM radios. Because it requires practice and is widely perceived as difficult, it is rarely attempted.[101] It is also limited by the range of FM radios – typically about 25 kilometers or less, depending on terrain. The other option for passing data is by the exchange of floppy disks. Traditionally, this has been one of the most common ways of passing information between STAMIS systems at lower levels, particularly during field operations.[102] The obvious drawback to this method is the requirement that someone travel back to the DS maintenance unit on a daily basis to deliver the disks. In addition, floppy disks and disk drives are not always reliable when exposed to the dust and other hazards of field operations.

During field operations, STAMIS systems that are located relatively close to a Mobile Subscriber Equipment (MSE) Small Extension Node (SEN) switch can be hard-wired into a field LAN. The SEN then provides data connectivity to other MSE nodes.[103] However, the drawbacks to a hard-wire LAN in the field include the time needed for set-up and tear-down, its susceptibility to damage, either from vehicle traffic or enemy action, and the need for fairly extensive supplies of wire. Recently, a new device called a Combat Service Support Automated Information System Interface (CAISI) has been fielded. The CAISI acts as a wireless LAN that can connect up to 294 systems over a fairly wide area (e.g., a brigade or division support area). It does not, however, eliminate the need to connect to a SEN for longer-range data transmission.[104] As will be discussed below, the MSE system itself has some significant drawbacks during mobile operations.

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[101] Author's experience.

[102] See, for example, Captain Joseph M. Calacicco, "The CAISI Connection: A Wireless Solution for the Digitized Battlefield," *Army Logistician,* November-December 2001, 33.

[103] Within a Brigade Combat Team, there is normally one SEN with the Brigade Main Command Post and another at the FSB Command Post/Brigade Rear Command Post. See FM 63-20, *Forward Support Battalion*, 4-9.

[104] Calacicco, 32-34.

The Information Network – Asset Visibility

Total asset visibility (TAV) – "the ability to 'see' materiel across the distribution continuum"[105] – is a key element of distribution management. In-transit visibility (ITV) is a sub-set of TAV. TAV provides "the status of asset production, repair, fielding, requisition, and stockage levels," whereas ITV "simply provides the status of assets passing through nodes in the transportation system."[106] A group of technologies collectively referred to as Automatic Identification Technology (AIT) is critical to the rapid processing of information needed to maintain asset visibility. AIT includes such media types as bar codes, optical memory cards, radio frequency identification tags, and satellite-tracking systems. These devices and systems capture information electronically and pass it to the various distribution-related automated information systems (AIS). When used correctly, this "reduces the laborious and error-prone manual component of traditional data entry, improves accuracy, reduces physical processing time, and achieves precise asset visibility at all stages of the global distribution system."[107]

Bar codes, familiar to most people from the supermarket checkout line, provide item identification and document control information for individual items and shipments. When used with a hand-held scanner, they greatly speed the processing of materiel release orders (MROs) and transportation control and movement documents (TCMDs).[108] Optical memory cards (OMCs) are credit card-sized data storage devices that can store large amounts of data using a laser beam. They can be used to record the contents of multi-pack containers or other shipping containers. This automated manifest/packing list can then be shipped with the container as well as reported to a central TAV/ITV database.[109]

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[105] JP 4-01.4, V-3.
[106] Lieutenant Colonel Nicholas J. Anderson, "Challenges of Total Asset Visibility," *Army Logistician,* January-February 2001, 8.
[107] JP 4-09, V-11.
[108] FM 100-10-1, 6-16.
[109] FM 100-10-1, 6-16 to 6-17; JP 4-09, V-11.

Radio-frequency identification (RFID) tags are small devices attached to shipping containers. They can be programmed with TCMD and content information for the container. They communicate with fixed and hand-held interrogators through radio frequency energy. Fixed interrogators are positioned at key "choke points" along the distribution pipeline to recognize and automatically report the passage or arrival of a given container. Hand-held interrogators are used at cargo transfer nodes to determine the contents of sealed containers or to search for particular containers or even particular items without having to read individual packing lists or optical memory cards. RFID technology also provides the capability to remotely and automatically modify shipping addresses and other cargo disposition instructions.[110]

The two primary ITV satellite-tracking systems currently in use by Army CSS units are the Movement Tracking System (MTS) and the Defense Transportation Reporting and Control System (DTRACS). Both are adaptations of technology currently used by commercial shipping firms, and are designed to track the movements of convoys or even individual vehicles. Because they use satellite communications, they are essentially free of distance limitations. MTS comes in two versions: a control station and a "mobile" station. (Despite the names, both versions are vehicle mounted and quite mobile.) Each version essentially consists of a ruggedized laptop computer, and a combination global positioning system (GPS) and satellite communications antenna. The antenna has a magnetic mount for rapid installation on vehicles, and the entire system is described as having "simple and fast installation in under 10 minutes."[111] In a fully digitized "Force XXI" division such as the 4th ID, the DISCOM (including all five support battalions) is authorized a total of 56 control stations and 396 mobile stations.[112] This allows all distribution "platforms" to be equipped with MTS, right down to individual cargo and fuel trucks.

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[110] FM 100-10-1, 6-17 to 6-18; JP 4-09, V-11.

[111] 3d Infantry Division, "Movement Tracking System" [slide presentation], nd, slide 8; provided to the author by LTC Melinda Woodhurst. For more on the intended capabilities of MTS, see FM 100-10-1, 6-13 to 6-14.

[112] 3d Infantry Division, "Movement Tracking System," slide 1. At the time of OIF, the 4ID was the Army's only division which had been fully equipped according to the new, digitized Force XXI design.

In addition to enabling logistics C2 nodes to track locations of CSS assets, MTS allows the transmission of short text messages. It is intended to "provide CSS commanders with near-real time transportation asset location, movement data, and situational awareness." MTS "improves the efficiency of the distribution system" by enabling logisticians to "to redirect supplies, identify/avoid hazards, [and] inform drivers of unit location changes."[113]

DTRACS, which is similar in concept to MTS, has been in use by the US Army in Europe for approximately five years, including extensive use in the Balkans. It includes a combination GPS and satellite antenna mounted on each transportation platform, along with a small keyboard/screen device that allows the vehicle operator to exchange short text messages with other DTRACS devices. A central base station, located at an appropriate headquarters or other node, tracks the location of the various systems and displays them on a computer screen.[114]

The Communications Network

The Army's primary long-range voice and data communications system at corps level and below is the Mobile Subscriber Equipment (MSE) system. MSE uses a series of node centers (NC) which link together to form a seamless communications grid. Other nodes, referred to as Large Extension Nodes (LENs) and Small Extension Nodes (SENs), collocate with various headquarters and other subscribers to provide them entry into the grid.[115]

The primary drawback to MSE is that nodes (including LENs and SENs) must be stationary to operate. They communicate with each other through point-to-point UHF radio links, using 15-meter tall directional antennas. Since each node center links to several other NCs in order to establish a grid, there are multiple antennas required at each site. Thus, setting up a node center is fairly complicated and time-consuming. The planning range for the UHF radio is 40

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[113] 3d Infantry Division, "Movement Tracking System," slide 6.
[114] "Movement Tracking System Prototypes Succeed in Real-World Missions," *Army Logistician,* September-October 1999, 48-49. See also JP 4-09, V-11 to V-12.
[115] U.S. Department of the Army, FM 11-43, The Signal Leader's Guide (Washington, 1995), 3-1 to 3-13.

kilometers, but because it is a line-of-sight radio system, intervening terrain features may reduce the actual range that can be achieved between nodes. Lastly, the line-of-sight feature means that there must be a continuous chain or grid of node centers between two points for them to communicate with each other. Depending on the precise geometry of the grid, the loss of one or more node centers could potentially interrupt communications.[116]

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[116] U.S. Department of the Army, FM 11-55, *Mobile Subscriber Equipment (MSE) Operations* (Washington, 1999), 1-8 to 2-6.

CHAPTER THREE

CLASS IX SUPPLY OPERATIONS DURING OIF

As discussed in the previous chapter, JP 4-01.4 describes the theater distribution system as consisting of four "independent and mutually supporting networks," namely, the physical, financial, information, and communications networks.[117] During OIF, at least three of these seem to have experienced major difficulties. The physical network was handicapped by a significant shortage of transportation assets, as well as by the enormous distances and limited transportation infrastructure of the theater of operations. The vast distances involved, combined with the speed of the coalition advance, also hamstrung the communications network, which proved largely unable to either pass the data upon which the information network relied or support the command and control of physical network assets. Beyond the communications connectivity problems, the information system exhibited significant additional flaws that interfered with the requisitioning and tracking of supplies.[118]

Organizational Structure for OIF Logistics

The 377th Theater Support Command was the senior Army logistics headquarters in theater during OIF. The 377th is an Army Reserve unit normally headquartered in Louisiana. They were habitually affiliated with the US Third Army, which serves as the Army component of the US Central Command. Thus, they were familiar with the area and the mission. The 377th's materiel management center was the 321st MMC.[119] Other subordinate elements of the 377th TSC during OIF with a significant role in Class IX distribution were the 143d Transportation Command,[120] the 68th CSB, and eventually, the 43d ASG.

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[117] JP 4-01.4, I-8.
[118] See, for example, Eric Schmitt, "Army Study of Iraq War Details a 'Morass' of Supply Shortages," *New York Times,* 3 February 2004, sec. A, p. 1.
[119] Major Paul Williams, "MG David Kratzer interview, Commander, 377th TSC," OIF Study Group, 22 May 2003; and Major Paul Williams, "MAJ Duncan MacMullen interview, Supply Support Operation Officer, 321st MMC," OIF Study Group, 7 June 2003.
[120] Sergeant Frank N. Pelligrini, "Supporting Gulf War 2.0," *Army,* September 2003, 22-26.

At the corps level, the primary logistics headquarters was the 3d Corps Support Command (COSCOM). Normally stationed in Germany with the V Corps, the 3d COSCOM had traditionally focused on the defense of Germany as part of NATO, and had not deployed outside of Europe in decades. Major subordinate elements of the COSCOM that accompanied it from Germany included the 19th MMC (or CMMC), the 27th Transportation Battalion (a movement control unit), the 7th Corps Support Group (Rear), and, eventually, the 16th CSG (Forward) in support of the 1st Armored Division (1AD). The 7th CSG (Rear) included, among other units, the 181st Transportation Battalion, which ultimately served as a headquarters for a variety of truck companies.

Also subordinate to the 3d COSCOM were the 24th and 101st Corps Support Groups (Forward), in support of, respectively, the 3d Infantry Division and the 101st Airborne Division (Air Assault). These two CSGs were habitually aligned with their supported divisions, and were collocated with them at home station (at Forts Stewart and Campbell, respectively). However, they were normally aligned with the XVIIIth Airborne Corps' 1st COSCOM, and had no prior working relationship with the 3d COSCOM. In addition, both CSGs experienced significant changes to their normal task organization and habitual relationships during OIF.[121]

Deployment Sequence and Timeline

One factor that influenced all other aspects of OIF distribution management was the relative lateness with which logistics elements deployed into theater. In 2002, the US Central Command (CENTCOM) leadership selected, from several options, a plan for "a one-division attack using Army pre-positioned stocks to attain speed and surprise to reach Baghdad in about 10 days."[122] This plan, which accepted supply risks in exchange for speed, was expected to keep

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[121] CW4 Michael Campbell, "LTC Dave Mullen interview, 101st Corps Support Group," OIF Study Group, 23 May 2003.

[122] Dr. Gary A. Trogdon, "Logistics in the Desert," U.S. Army Center for Military History, December 2003, 14; available from https://www.cascom.army.mil/cssbl/PRIVATE/Rock/Index.htm; Internet; accessed 19 March 2004.

the Iraqis off balance and lead to a quick victory with few coalition casualties. The plan envisioned a "small, fast force supported by long supply lines."[123]

In late 2002, Secretary of Defense Rumsfeld directed an additional change to the existing CENTCOM war plans. Believing that the original deployment list had too many forces, Secretary Rumsfeld directed that the original Time Phased Force Deployment Data (TPFDD) process be suspended in favor of a Request-for-Forces (RFF) process in which the deployment of individual units had to be approved by DOD on a case-by-case basis. Under the new system, logistics units tended to arrive in theater three to six weeks behind the combat units they were intended to support, and the overall proportion of logistics troops deployed was smaller than it would have been under the original TPFDD.[124]

This delay in the arrival of logistics elements had wide-ranging effects on the theater distribution system. As pointed out in a General Accounting Office report on OIF Logistics, "most Army and Marine Corps logistics personnel and equipment did not deploy to the theater until after combat troops arrived, and . . . most Army [logistics] personnel did not arrive until after major combat operations were underway."[125] The Theater Distribution Center (TDC) was not set up until well into the deployment sequence, and 377th TSC did not have a dedicated unit in place to run the TDC until 21 March 2003, the day that coalition forces crossed the line of departure into Iraq.[126] Similarly, the theater Class IX warehouse, located at Camp Arifjan, Kuwait, was slow to be stood up. Captain Terra Arnold of the 321st MMC described the situation when she arrived: "I was part of the original cell that deployed to the theater in February. Once I got here the Class IX warehouse was not set up. The accountability of parts did not exist. We had

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[123] Ibid.

[124] Ibid., 14-15. For more on the war plan, see Cordesman, *The Iraq War,* 149-152.

[125] U.S. General Accounting Office, GAO-04-305R, *Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities During Operation Iraqi Freedom,* by William M. Solis, 18 December 2003, 3; available from http://www.gao.gov/new.items.d04305r.pdf; Internet, accessed 6 March 2004.

[126] U.S. Army Combined Arms Support Command OIF Distribution Rock Drill, "Theater Distribution Center"[slide presentation], Fort Lee, VA, 9-11 March 2004, slides 4-6; available from https://www.cascom.army.mil/cssbl/PRIVATE/Rock/Products.asp; Internet; accessed 19 March 2004.

containers all over the place and no one knew what was in them or who owned them."[127] The

249th Quartermaster Company (Repair Parts Supply), an active duty unit from Fort Bragg, was

designated to run the Class IX warehouse. A request by theater logistics planners that it be moved

up in the deployment sequence was apparently disregarded,[128] and the company did not arrive

until mid-March. When the company finally took responsibility for the Class IX warehouse on 17

March, the warehouse was still nothing more than a covered building, with no shelving or storage

bins.[129]

Theater Distribution Center

The General Accounting Office's preliminary report on OIF logistics identified

"insufficient and ineffective theater distribution capability" as one of the major factors

contributing to logistics support problems in OIF.[130] It summarized the problems as follows:

> DOD did not have a sufficient distribution capability in the theater to effectively manage
> and transport the large amount of supplies and equipment deployed during OIF. For
> example, the distribution of supplies to forward units was delayed because adequate
> transportation assets, such as cargo trucks and materiel handling equipment, were not
> available within the theater of operations. 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 at different locations.[131]

The Theater Distribution Center (TDC) was established at Camp Doha, Kuwait,

approximately 25 kilometers west of downtown Kuwait City. One problem with the TDC was

that it was located too far from the Class IX supply point, which was at Camp Arifjan, about 70

kilometers southeast of Camp Doha. When supplies arrived at the APOD (or at the Sea Port of

Debarkation (SPOD) at Ash Shu'aybah, roughly 60 kilometers by road from the TDC), they

would first go to the TDC. Any repair parts not immediately sent forward from the TDC would

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[127] Major Paul Williams, "CPT Terra Arnold interview, Plans and Operation 321st MMC," OIF Study Group, 22 May 2003.
[128] "Historical EAC Maintenance Structure," OIF Study Group, 7 May 2003.
[129] Major Paul Williams, "CPT Kirsten Lewis interview, Commander, 249th QM, 68th CSB," OIF Study Group, 10 May 2003, 1-2.
[130] GAO-04-305R, *Defense Logistics During OIF,* 3.
[131] Ibid.

then have to be transported to the Class IX supply point at Camp Arifjan for storage. This 140 kilometer round trip placed an extra burden on already scarce transportation assets.[132]

This was the first time that the Army had ever established a TDC in an active theater.[133] When combined with the late arrival of various support units, growing pains were almost inevitable. Despite that, however, it is difficult to escape the conclusion that TDC operations for OIF were poorly thought out in the original plan. Initially, OIF materiel coming into Kuwait was routed through the Central Receiving and Storage Point (CRSP) at Camp Doha, "a peacetime contractor-run operation designed to handle materiel for the rotational brigade and tenant unit activity in Kuwait."[134] The initial assumption seems to have been that these contractor personnel would continue to be adequate for the task of theater distribution. However, the CRSP quickly became backlogged and it became obvious that the contractor personnel alone would be insufficient for the theater distribution mission. It also became clear that Camp Doha itself did not have adequate space, and the TDC was moved to a new location just south of the original camp.[135] On 5 February 2003, a detachment from the 693d Quartermaster Company (USAR), with approximately 50 personnel, was assigned to take over the operation of the TDC. They had been activated in January 2003 and sent to Kuwait to download cargo ships. They had no particular training for the TDC mission, and they initially had no automation equipment, no materiel handling equipment (MHE), no life support, and had to provide their own security in addition to performing their distribution center mission.[136] According to the commander of the 693d QM Company, when he received the mission on 5 February, the TDC consisted of an open field with 28 sea-land containers sitting in it. Then, five days later, "truck after truck began

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[132] Colonel Joseph Walden, "Distribution Organizations in Support of Operation Iraqi Freedom (OIF) – A Logistics Leader's Perspective," *Army Distribution Management Newsletter,* Fall 2003, 1; available from https://www.cascom.army.mil/ADM/PRIVATE/DM.htm; Internet; accessed 16 March 2004.

[133] Walden, "Distribution Organizations," 1.

[134] CASCOM OIF Distribution Rock Drill, "Theater Distribution Center," slide 5.

[135] MAJ Paul Williams, "LTC John Collie interview, Commander, 68th Corps Support Battalion," OIF Study Group, 10 May 2003, 3

[136] MAJ Paul Williams, "CPT Erik Hansen interview, Commander, 693d QM Co (GS)," OIF Study Group, 11 May 2003, 1-2.

flowing into the site with . . . pallets from the APOD along with 20 and 40 foot containers from the SPOD."[137] Sometime that month, the 68th CSB from Fort Carson was assigned responsibility for the TDC as well as for the Class IX warehouse at Camp Arifjan. Initially, however, the detachment from the 693d QM Company remained the only asset available to the 68th CSB at the TDC.[138] Other temporary work details were eventually added from nearby general support units. However, not until 21 March, the day that coalition forces crossed into Iraq, did an appropriately tailored unit, the 3079th Cargo Distribution Company (Provisional), take over the TDC mission.[139]

Although the manpower and MHE resources available at the TDC gradually grew, both the 3ID and 101st Airborne Divisions found that they needed to supplement the efforts of the TDC work force. The OIF Study Group's Maintenance Assessment Summary states that "Units created rear cells 'out of hide' and placed them at Camp Doha to try to gain control of their unit's repair parts at the TDC and push them forward . . ."[140] The 3ID DISCOM reported that "Division people at the TDC . . . were extremely useful in segregating critical supplies to maximize limited trans assets."[141] Major Kurt Ryan of the 101st Division's DMMC reported that due to the TDC's immature status at the start of operations, units did their own pallet breakdowns to keep control of their parts.[142]

Despite these efforts, however, the limited Class IX pushes produced by the TDC still had significant problems. Major Ina Yahn, the 3ID Maintenance Officer, reported that

> The flow of repair parts through the TDC was a major problem. Only three PLS [Palletized Load System] trucks were allocated to the 3rd ID per day to move repair parts forward. What parts did get moved by these units were taken to LSB Cedar [south of An Nasiriyah and Tallil Airbase] and dumped. The 3d ID provided the TDC with a list of all assigned units' DODAACs so the division's repair parts could be identified and segregated. Initially, the TDC personnel were identifying one DODAAC on a pallet and

[137] Williams, "CPT Hansen interview," 2.
[138] Williams, "LTC Collie interview," 3. The 68th CSB was normally a tactical corps support battalion.
[139] CASCOM OIF Distribution Rock Drill, "Theater Distribution Center," slide 6.
[140] "Field Collection Team CSS Maintenance Assessment (Summary), OIF Study Group, nd, 5.
[141] 3d Infantry Division DISCOM, "3 DISCOM Support Operations Briefing," OIF Study Group, 26 April 2003, slide 25.
[142] CW4 Michael Campbell, "MAJ Kurt Ryan interview, 101st ABN DIV DISCOM MMC," OIF Study Group, 22 May 2003, 1.

sending the entire pallet of repair parts to that unit, disregarding the possibility of multi-unit pallets. It is unknown how many repair parts were lost or misdirected, but the bottom line is, the unit that needed certain parts did not get them.[143]

The experience was similar in the 101st. Major Ryan reported that "Class IX was pushed to LSB Dogwood [southwest of Baghdad], but parts for all units were dumped there together and units had to fend for themselves to secure their parts. 101st put a five man cell at Dogwood for that purpose."[144] The 101st Division's 626th FSB reported that parts pallets contained not only their own parts, but parts for other units as well, and they assumed other units were getting their (626's) parts. They also reported that when parts were brought forward, "the aviation or ground transport units simply dropped the parts all over the place, making gathering and protection of the supplies very difficult."[145] Furthermore, it does not appear that the problems with mixed pallets ceased with the end of major combat operations. As late as 26 May 2003, the 4ID DISCOM commander reported that "the units managing the TDC and LSAs are not configuring their pallets correctly. . . . Parts pallets are mixed with different units instead of being unit configured. . . . [This] requires more manpower and time to repackage and redirect the parts where they need to go."[146] Apparently APOEs in CONUS and elsewhere were contributing to this problem by palletizing loose cargo without regard to its destination SSA, thus creating additional work and chance for error at the TDC.[147]

Transportation Unit Availability

As mentioned above, the GAO's preliminary report on OIF logistics identified a lack of transportation assets as one of the key contributing factors to what they termed an "insufficient

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[143] CW4 Michael Campbell, "MAJ Ina Yahn interview, 3d Infantry Division Materiel Officer," OIF Study Group, 14 May 2003, 2.

[144] Campbell, "MAJ Ryan interview," 2.

[145] CW4 Michael Campbell, "626th FSB Staff interview, 3rd BCT, 101ABN DIV," OIF Study Group, 24 May 2003, 3.

[146] CW4 Michael Campbell, "COL James Rentz interview, Commander, 4th ID DISCOM," OIF Study Group, 26 May 2003, 2.

[147] U.S. Army Combined Arms Support Command OIF Distribution Rock Drill, "Class IX"[slide presentation], Fort Lee, VA, 9-11 March 2004, slide 1; available from https://www.cascom.army.mil/cssbl/PRIVATE/Rock/Products.asp; Internet; accessed 19 March 2004.

and ineffective theater distribution capability."[148] This view was widely echoed among OIF participants. For example, the 3ID DISCOM reported in late April, 2003 that "Transportation assets and control will remain as the single greatest area for improvement in this fight."[149] The 3ID AAR states: "The lack of transportation assets frustrated the logistics arena. The poor response [of] logistical support, especially Class IX was largely due to the lack of ground and air support."[150] Later, it states: "The lack of general transportation assets (light/medium and medium truck companies) and the failure of host nation assets to perform as planned, had a negative impact on the quantity and consistency of support to the division. During planning, an assumption was made that host nation assets would offset this shortage of assets. Host nation trucks never performed as efficiently as assumed."[151]

According to LTC Melinda Woodhurst, the 3ID G-4, the division required approximately 112 truckloads of supplies daily just for routine sustainment. This total did not include ammunition resupply requirements. However, 3d COSCOM's transportation assets were stretched so thinly that on one day in late April the COSCOM was able to offer 3ID a mere seven truckloads.[152] Given the continual need for food, water, ammunition, and Class III package products, it is easy to see how Class IX could get crowded out by other classes of supply.

The exact number of trucks available during OIF is somewhat difficult to pin down, as it was constantly growing as additional units arrived in theater. However, on G-Day, the day that coalition ground forces crossed into Iraq, the 3d COSCOM had available two PLS truck companies, two Heavy Equipment Transporter (HET) companies, and three petroleum (POL) truck companies.[153] Of these, the POL companies, equipped with 5000 gallon tanker trailers,

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[148] GAO-04-305R, *Defense Logistics During OIF* , 3.
[149] 3d Infantry Division DISCOM, "3 DISCOM Support Operations Briefing," slide 36.
[150] "3ID AAR," 198.
[151] Ibid., 203.
[152] Interviews of LTC Melinda Woodhurst by the author, 5 August 2003 and 15 April 2004. LTC Woodhurst explained that a "truckload" in this case could be either a PLS flat-rack or a flatbed semi-trailer.
[153] U.S. Army Combined Arms Support Command OIF Distribution Rock Drill, "TC Unit Availability"[slide presentation], Fort Lee, VA, 9-11 March 2004, slide 3; available from

could obviously be used only for carrying fuel.[154] Likewise, the HETs tended to be fully committed to their particular mission of moving heavy armored vehicles and other heavy equipment. That left only the two PLS companies available for general cargo such as food, bottled water, construction and barrier material, ammunition, medical supplies, and repair parts.

By MTOE, a PLS truck company has 48 PLS trucks, plus an equal number of PLS trailers. One truck plus one trailer equals one PLS "system." Each truck and trailer carries one PLS "flat-rack," each capable of carrying about 11 tons or a 20 foot shipping container.[155] Even if we count each PLS "system" as two "truckloads," two PLS companies combined only equate to 192 truckloads (96 trucks and 96 trailers). Comparing this to the daily sustainment requirement (less ammunition) of 112 truckloads for the 3ID described by LTC Woodhurst, we see that this leaves only 80 truckloads for all other COSCOM requirements, to include 3ID's ammunition resupply, sustainment of the COSCOM's own units, corps level aviation and artillery formations, and units such as the 101st Airborne Division still assembling in Kuwait. Furthermore, this analysis does not account for the inevitable maintenance losses within the truck companies.

If the lines of communications were short enough, each truck could potentially make more than one round trip per day. In OIF, however, as coalition forces advanced, that quickly became unfeasible. Eventually, even making one round trip in a single day became impossible. Thus, by any analysis, the number of trucks available to 3d COSCOM was significantly short of requirements.

The trucks available to 3d COSCOM did increase over the course of the war. By one count (differing slightly from that described above), the cargo trucks (not counting HETS and fuelers) available to the COSCOM on 19 March (just before G-Day) were 91 PLS, 60 22-1/2 ton

https://www.cascom.army.mil/cssbl/PRIVATE/Rock/Products.asp; Internet; accessed 19 March 2004. One other POL truck company, the 515th, had apparently not yet linked up with its vehicles in Kuwait.

[154] Technically, the tractor trucks belonging to the POL companies could have been used to pull cargo trailers instead of their normal fuel trailers, but given the volume of fuel required by forward units, that was not a viable option.

[155] ST 101-6, *Combat Service Support Battle Book,* 6-51.

flatbed tractor-trailer rigs (commonly referred to as "stake and platform," or "S&P" trailers), and

48 5-tons. (An S&P trailer is roughly equal to a PLS "system" in cargo capacity, while a 5-ton

carries significantly less than a PLS truck.) On 28 March, about a week into the war, this count

increased to 142 PLS (i.e., three companies), 120 S&Ps, and 48 5-tons. By 8 April, as the 3ID

was fighting in Baghdad, the count increased to 236 PLS (five companies), 125 S&Ps, and 64 5-

tons.[156] However, while the numbers of PLS and S&Ps more than doubled between G-Day and 8

April, the requirements increased by at least that much. On G-Day and the first few days

thereafter, 3ID was the only major element of V Corps engaged in the ground fight. By 8 April,

additional units in the fight included the 101st Airborne Division, a brigade of the 82d Airborne

Division, and elements of the 2d Cavalry Regiment and the 3d Brigade/1AD.[157] Furthermore, by

early April, the lead elements of the corps (3ID in Baghdad) were operating more than 300

congested and dangerous road miles from the Kuwait border.

The condition of these lines of communication (LOCs) was significant. Even had

seemingly adequate transportation assets been provided, (something which was certainly not the

case), the friction experienced on the LOCs would still have tended to throw logisticians' plans

off. As described in the 3ID AAR,

> Difficulty of movement on routes . . . caused unit movements to last as much as 100%
> longer than planned. Assumptions regarding the ease of movement and lack of contact
> proved to be optimistic. Despite detailed planning, the failure of these assumptions
> caused movement forward not to occur as planned. Lack of detailed knowledge of the
> poor condition of the route . . . was one factor that increased the difficulty of executing
> unit moves. Enemy contact also slowed movement forward . . . . Most units could not
> attain/sustain the 30 kmph planned movement speeds in this environment. The slower
> movement caused routes to back up with traffic and become congested. Failure to keep
> later moving units off congested routes added to the congestion experienced by units
> already on the routes. Another factor contributing to the inefficient movement forward
> was a failure by units to comply with accepted convoy procedures. Units moved on
> routes without march credits, stopped on roads for rest halts, and moved on the routes
> without regard for the other units on the route. This lack of convoy discipline caused
> traffic jams and created situations where units moved three abreast on two lane routes.

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[156] CASCOM OIF Distribution Rock Drill, "TC Unit Availability," slide 4.

[157] Williamson Murray and Robert H. Scales, Jr., *The Iraq War* (Cambridge, MA: Belknap Press
of Harvard University Press, 2003), 195-203. For 2d Cavalry Regiment, see Jackson, "CPT Mescall
interview," 2.

Vehicle damage and delays in movement were the result of all of this uncoordinated activity.[158]

Given the shortage of trucks and the condition of the supply routes, aerial transportation might have been an option for moving critical repair parts. In fact, 3ID did plan for the use of CH-47 helicopters for transporting parts. As the division had no CH-47s of its own, these aircraft belonged to V Corps. As reported in the division AAR, "Continually, it was briefed to the BCTs that two CH-47s were available to conduct daily aerial resupply to the BCTs. Unfortunately, little to no daily aerial resupply was conducted following the early stages of combat."[159] According to LTC Woodhurst, the division G-4, this was not for lack of trying. She related trying repeatedly to coordinate CH-47 supply runs, only to see them cancelled for one reason after another.[160] Reportedly, the first use of CH-47s to push Class IX to 3ID did not take place until 4 April, when the division received five helicopter loads.[161]

Communications Connectivity Issues

According to MAJ Yahn, the 3ID's maintenance officer, "Communications problems and connectivity problems were an issue throughout the entire war. Units could not report or requisition reliably via their computer systems."[162] Due to the distances involved, "Radios [could not] communicate reliably to the rear echelon [of the division], and during movements, that [was] the only source of communication available to the support units. Commanders' reports were the only source of information for the MMC to learn of unit statuses and requirements."[163]

As explained in Chapter 2, the Mobile Subscriber Equipment (MSE) system is the primary means of long-range communication and data transfer at division and corps level. A summary of maintenance operations produced by the OIF Study Group explains that "Logistics

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[158]"3ID AAR," 209.
[159]" 3ID AAR," 205.
[160] Interview of LTC Melinda Woodhurst by the author, 5 August 2003.
[161] CASCOM OIF Distribution Rock Drill, "Class IX," slide 5.
[162] Campbell, "MAJ Yahn interview," 3.
[163] Ibid.

data communications was impossible while on the move, because logistics data systems are designed with a reliance on the MSE network, which cannot operate while on the move."[164] The 3ID's 1st BCT reported that "as a result of the pace of offensive operations, MSE was rarely a viable option for data transmission and reporting."[165] Even once units stopped moving and MSE was able to set up, it apparently remained somewhat trouble-prone. In an 18 April 2003 memorandum entitled "AAR – War Time, Communications," the Signal Officer of the 16th CSG reported that out of the 21 days his unit had been at FLB Cedar [south of the town of An Nasiriyah, and thus fairly close to Kuwait in comparison to the total distances advanced by coalition forces], they had experienced a total of 98 hours of complete outages in their MSE communications. In his words, "Over four full days of outages for your primary means of communications is unacceptable."[166]

Units in OIF used a variety of other systems to help fill the gap created by MSE's inability to operate on the move. Some of these were military-developed systems, while others were commercially-available systems adopted for military use. One of the most successful of the former was a system known as Blue Force Tracking (BFT). A simplified variant of the "Force XXI Battle Command, Brigade and Below" (FBCB2) system, BFT differed from FBCB2 in using satellite-based communications rather than the "Enhanced Position Location Reporting System" (EPLRS) ground-based radio system used by FBCB2. Unlike FBCB2, which is installed in nearly every vehicle in the 4th Infantry Division, BFT was only fielded to OIF units in numbers sufficient to equip key command and control vehicles. For example, the 3ID received approximately 150 BFT systems.[167] (Limited numbers were also fielded to U.S. Marine Corps

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[164] "Field Collection Team CSS Maintenance Assessment (Summary)," OIF Study Group, 7.
[165] 1st Brigade Combat Team, 3d Infantry Division. "Combat Operations Lessons Learned." OIF Study Group, nd, 4.
[166] Major Paul R. Illif, "MEMORANDUM for S3, 16th CSG, SUBJECT: AAR – War Time," OIF Study Group, 18 April 2003.
[167] "3ID AAR," 52. See also LTC John W. Charleton, "Baptism by Fire: One Lieutenant Colonel's Conversion to Digital Battle Command," *Infantry,* Fall 2003, 30-32, for a good account by a 3ID battalion commander of the usefulness and effectiveness of BFT/FBCB2.

and British units in theater.[168]) According to the 3ID AAR, the primary reason for BFT's fielding

was to facilitate tracking of friendly forces at echelons above division. However, it proved to be a

major asset at division level and below as well. As described in the 3ID AAR,

> BFT gave commanders situational understanding that was unprecedented in any other conflict in history. It allowed the division to operate with common graphics on the move at all levels . . ., to send short messages and graphics via email, and to locate and identify every unit on the battlefield that had a BFT system. BFT provided the ability for the operator to communicate beyond line-of-sight. This proved to be essential as many units operated in a battlespace exceeding the range of their traditional FM radio communications and did not have single-channel tactical satellite (TACSAT) radios available. FBCB2/BFT replaced mobile subscriber equipment (MSE) data systems as the division's primary method to pass fragmentary orders (FRAGOs) once continuous offensive operations began. . . . The consensus from the division was that [BFT] worked phenomenally well."[169]

In spite of its effectiveness for command and control, BFT was not a panacea for the

logistics information network. While it did allow the passing of messages concerning critical

repair parts requirements, it was not able to replace MSE as the vehicle for STAMIS data

connectivity. Furthermore, the limited numbers available meant that, in 3ID at least, most combat

support and CSS elements received BFT in very small quantities. For example, the brigade S-4

was the only logistics entity within a BCT who had a BFT system. As the division AAR pointed

out, the brigade S-4s were not always collocated with the FSBs, leaving them without situational

awareness concerning maneuver units.[170]

The closest counterpart to BFT in most logistics elements was the Movement Tracking

System (MTS) or its close relative, the Defense Transportation Reporting and Control System

(DTRACS). 3ID received 15 MTS control stations (CS) and 100 mobile stations (MS). While far

fewer than the quantity authorized for a Force XXI DISCOM (56 and 396, respectively), it still

provided the division's logistics assets with a much needed capability. In the FSBs, for example,

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[168] Captain James Conatser and Captain Thane St. Clair, "Blue Force Tracking – Combat Proven," *Armor,* September-October 2003, 21. This article provides a good technical description of FBCB2 and BFT.

[169] "3ID AAR," 52.

[170] Ibid., 52 and 207.

the distribution was one CS for the battalion SPO and one CS and six MS in the supply

company's POL section (or in other words, about one mobile system for every two 5000 gallon

fuel tankers).[171] The 3ID AAR reported that MTS was "very helpful to the division transportation

office (DTO)/ movement control office (MCO). [It] has been the most consistent communications

system. [It] has been used to communicate with units and provide unit movement and positioning

information. This provided situational awareness and enabled the DTO and MCO to transmit

requirements quickly and consistently even while moving."[172] The Support Operations Officer of

the 26th FSB reported that "MTS was most helpful. . . . It turned out huge. No other comms

worked. . . .The message text was very beneficial to us."[173]

DTRACS also seems to have been quite successful. The 101st CSG reported that they had

it in their C2 vehicles and used it to control convoys, maintain asset visibility, and call in

MEDEVACs.[174] Major Illif of the 16th CSG stated that "DTRACS is the most reliable form of

communications we have. Once DTRACS came on line, we only experienced 1 hour of outages

due to satellite issues. . . . DTRACS must be standardized throughout the Army."[175]

Another means of long-range communication available was single channel tactical

satellite (TACSAT) radio. While these proved very useful, the limited numbers of radios

available and the limited allocation of TACSAT frequencies meant that they had relatively little

impact on logistics operations. For example, 3ID had only 49 TACSAT radios and operated only

three TACSAT nets: C2, fires, and operations and intelligence (O&I).[176] While this would not

necessarily have precluded passing critical logistics information from time to time, other systems

seem to have been more widely used for that purpose.

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[171] 3d Infantry Division, "Movement Tracking System" [slide presentation], nd, slide 2.
[172] "3ID AAR," 207-208.
[173] "MAJ Mark Weinerth [interview], 26 FSB, Support Operations Officer, FSB supporting 2 BCT, 3d ID (main effort)," OIF Study Group, 11 May 2003, 2.
[174] Major Kenneth Kelley and CW4 Michael Campbell, "COL Gerald Dolnish and Staff interview, 101st CSG," OIF Study Group, 23 May 2003, 2-3.
[175] Illif, "AAR – War Time."
[176] "3ID AAR," 188 and 194-195.

Commercial satellite communications systems used in OIF included INMARSAT,[177] Iridium, and Thuraya satellite telephones. All three can be used on the move and are more or less similar in concept, but use different constellations of commercial satellites. INMARSAT phones offer both voice and high-speed data services. The typical INMARSAT telephone terminal has a small antenna about the size and shape of a laptop computer. Iridium telephones, in contrast, are fully hand-held, resemble a large cell phone or walkie-talkie radio, and have a built in antenna. They can pass data in the same way that a terrestrial telephone line passes data for a computer with a modem.[178] Both the INMARSAT and Iridium systems offer more or less world-wide coverage. Thuraya telephones resemble Iridium telephones in appearance and capability, but their satellite system provides coverage only of the Middle East, Europe, northern Africa, and western Asia.[179]

3ID was equipped with 43 Iridium phones. They found that the phones provided clear voice communications when they worked, but calls would often terminate unexpectedly or fail to connect in the first place. Lieutenant Colonel Woodhurst, the 3ID G-4, reported that she used an Iridium phone frequently to communicate with the brigade executive officers forward and with the division's rear element back at Camp New York in Kuwait. However, her calls were nearly always cut off after 1-1/2 to 2-1/2 minutes. She also reported that the division's MMC was "sporadically successful" in sending data with an Iridium phone.[180] Other units seemed to share the opinion that the Iridium phones were somewhat troublesome. The 101st CSG described them as "spotty."[181] Major Illif of the 16th CSG described them as "marginally sufficient as a back-up

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[177] INMARSAT stands for International Maritime Satellite. Despite the name, they are now widely used by land-based users as well. See Wikipedia On-line Encyclopedia, "INMARSAT;" available from http://en.wikipedia.org/wiki/Inmarsat; Internet; accessed 11 April 2004.
[178] Wikipedia On-line Encyclopedia, "Iridium (satellite);" available from http://en.wikipedia.org/wiki/Iridium (satellite); Internet; accessed 11 April 2004.
[179] For an overview of Thuraya telephone features, see http://www.cellular.co.za/thuraya.htm; Internet; accessed 18 April 2004.
[180] Interview of LTC Melinda Woodhurst by the author, 15 April 2004.
[181] Kelley and Campbell, "COL Gerald Dolnish and Staff interview," 2.

mode of communications."[182] Nonetheless, they were the only means of long-range voice communications normally available to many logistics leaders.

A few INMARSAT telephone terminals were fielded to 3ID. However, they were received too late for the unit to learn to use them and they played no real role in OIF.[183] Other units seemed to find them effective, however. For example, MAJ Ryan of the 101st Airborne Division MMC reported using the INMARSAT for STAMIS "blasting," or data transmission. A post-war briefing produced by 3d COSCOM listed INMARSAT as one of the most effective communications means during OIF, along with single channel TACSAT and DTRACS. They listed FBCB2 (presumably the BFT version) and Thuraya telephones as also effective, but less so than the three previously mentioned systems.[184]

With the possible exception of INMARSAT, however, none of the communications systems discussed thus far really provides a satisfactory replacement for the MSE system in the role of STAMIS data connectivity. Some, such as BFT, MSE, and DTRACS, provide the capability to send short text messages, allowing forward elements to request certain high-priority repair parts from the rear. Others, such as TACSAT and the satellite telephones, offer the same capability through voice communications. However, all of these are work-arounds to the normal ULLS-SAMS-SARSS parts requisition process and are inadequate to support more than the most critical requisitions. The satellite telephones offer some capability for STAMIS connectivity, but this is essentially analogous to using a dial-up internet connection – workable, but not ideal, especially given the Iridium phone's reported tendency to interrupt calls.

Another system used in OIF for STAMIS data connectivity was VSAT, or Very Small Aperture Terminal. VSAT is a small (about 1 meter diameter) two-way satellite dish used for satellite communications of data, voice, and video signals, with the exception of broadcast

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[182] Illif, "AAR – War Time."

[183] "3ID AAR," 184-185, 192.

[184] U.S. Army Combined Arms Support Command OIF Distribution Rock Drill, "Command and Control"[slide presentation], slide 4, Fort Lee, VA, 9-11 March 2004; available from https://www.cascom.army.mil/cssbl/PRIVATE/Rock/Products.asp; Internet; accessed 19 March 2004..

television.[185] It is unclear how widely VSAT was available, if at all, during major combat operations. However, in late May, the 4ID DISCOM commander reported that his division was by then using it quite successfully: "Implementation of the VSAT system has been a good way to order parts. . . . Whereas before, the unit could not process requisitions electronically because of communications problems, using VSAT, the unit is passing between 3000 and 6000 requisitions per day. Prior to that, the unit had to transport floppy disks over a 900 kilometer LOC to process requisitions."[186] Like MSE, VSAT has the drawback that it cannot be used on the move. However, unlike MSE, it requires no cumbersome and vulnerable chain of intermediate ground-based node centers in order to communicate with some distant point.

Other STAMIS Connectivity Issues

Communications problems due to the great distances involved were not the only challenges to STAMIS connectivity in OIF. Many units seem to have encountered a variety of other major problems in getting their systems operating properly once they arrived in the theater of operations. As explained in the OIF Study Group's summary of maintenance operations,

> Units were required to deploy to OIF with "clean" STAMIS systems. Upon arrival in Kuwait, their ULLS, SAMS, and SARSS computers were filled with local parameters, DODAACs, and UICs by the supporting MMC. Many units encountered multiple problems from this procedure, such as several units [being] issued the same UIC, geographical parameters set for Germany instead of [South-west Asia], [and] DODAACs not completely built which caused rejection of parts requests. This was a huge contributing factor to units having major difficulties requesting and receiving repair parts.[187]

These problems seem to have plagued nearly all units, from the earliest deploying to those that arrived only after combat operations were underway. The 3ID's 1st BCT reported that during their pre-positioned equipment draw, "Supplies could not be drawn because of incorrect DODAACs established during the reception. Few control measures appeared evident to ensure

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[185] For basic information on VSAT, see http://www.webopedia.com/TERM/V/VSAT.html; Internet; accessed 11 April 2004.

[186] Campbell, "COL Rentz interview," 1.

[187] "Field Collection Team CSS Maintenance Assessment (Summary)," OIF Study Group, 2.

that when units left the gate they were ready for war."[188] The 1st BCT AAR went on to contrast the STAMIS integration process in Kuwait unfavorably with that used at the National Training Center (NTC) at Fort Irwin, California: "At the NTC all PLL clerks were pulled together to verify their ULLS box with DODAACs on arrival. . . . In less than a week all issues were complete. We still weren't straight at LD [time] in Kuwait."[189] The 24th CSG, in support of 3ID, reported that "STAMIS connectivity never happened. Units that moved out early could not get their boxes loaded. SARSS boxes were being built from the ground up," meaning that all data had to be manually input.[190] According to the 101st Airborne Division's DISCOM commander, the "rodeo" that was established in Kuwait to load all the unit's STAMIS computers "was not complete and caused problems throughout the initial phase."[191] The staff of the 101st Division's 626th FSB reported that they "had to learn the systems to contract, order, and establish accounts themselves, since there was no exchange of this kind of information from other units."[192] The 101st CSG reported that "All the unit's STAMIS systems were sterilized before deployment to facilitate integration with the 19th MMC . . . in Kuwait. The computers had to be loaded at Arifjan, and there were problems that affected the systems' performance."[193] The DISCOM Commander for the 4ID, which arrived in Kuwait only after combat operations were well underway, likewise reported that "The derivative DODAAC, sterile STAMIS computer issue was a problem just like [in] the other divisions. The selling point of Single Stock Fund was the unit's ability to unplug from home station, deploy, and plug back in. That did not happen."[194]

[188] 1st Brigade Combat Team, 3d Infantry Division, "RSOI and Pre-Combat Operations Lessons Learned," OIF Study Group, nd, 1.

[189] Ibid.

[190] Major Demitrius L. Jackson, "MAJ Stephen Smith, et al., interview, 24th CSG SPO," OIF Study Group, 12 May 2003, 3.

[191] CW4 Michael Campbell, "COL Rogers interview, Commander, 101st ABN DIV DISCOM," OIF Study Group, 22 May 2003, 1.

[192] Campbell, "626th FSB Staff interview," 2.

[193] Kelley and Campbell, "COL Dolnish and Staff interview," 1.

[194] Campbell, "COL Rentz interview," 1. The Single Stock Fund is a Department of the Army business process initiative to improve the functioning of the Army Working Capital Fund (AWCF). It streamlines previous operations by merging wholesale and retail elements of the AWCF into a single,

It is unclear exactly where the fault lay for this lack of smooth STAMIS integration. However, the OIF Study Group's Maintenance Assessment Summary points out that the 19th MMC was the organization providing derivative DODAACs and theater parameters, in place of the 321st MMC which normally handled that function for the Southwest Asia theater. The Maintenance Summary goes on to state:

> It is the opinion of the 101st [Airborne Division] senior supply technician and logistics analyst that the 19th MMC was unfamiliar with the procedures for loading theater parameters in division SARRS boxes. The procedure of arriving in theater with clean computers and loading theater parameters was never practiced in training exercises, also there was no established Standard Operating Procedure to guide the unit during the process; additionally the procedure involves eight processes (each with its own set of parameters) and is very time consuming since it must be done manually, one computer at a time. Retrograde tables were built for Germany so the 101st could not tap theater stocks in Kuwait until that issue was rectified. Other parameters such as the theater map location/geographical map location were built for Europe instead of [Southwest Asia], creating a further delay in processing parts requests.[195]

Some logistics personnel at theater level seemed to feel that much of the problem lay with deploying units. According to CW4 King O'Neal, the Installation Property Book Officer (PBO) at Camp Doha,

> Units deployed without proper support personnel. Most units left their PBOs, supply sergeants, supply clerks, or PLL clerks in the rear. The personnel who attempted to perform combat service support and logistics functions in lieu of the support personnel left in the rear were inadequate. . . . Units sent improper personnel on their advanced parties to coordinate and analyze logistical support requirements. It is essential that units ensure their S4 officer, S4 NCOIC, or PBO is actively involved and included in the advanced party team to coordinate and establish supply and support activity accounts. . . . Deploying units failed to request required UICs or DODAACs for all classes of supply. . . [Units used] incompatible supplementary (ship-to) addresses. Some units used improper DODAACs. Most units used their home station supplementary address instead of the deployment address. Their equipment was routed . . . to CONUS instead of theater.[196]

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nationally managed fund. See U.S. Army Materiel Command, "SSF Program Info;" available from http://www.amc.army.mil/g3/major_programs/ssfdesc.htm; Internet; accessed 21 May 2004.

[195] "Field Collection Team CSS Maintenance Assessment (Summary)," OIF Study Group, 2.

[196] Major Watson, "CW4 King O'Neal interview, Installation Property Book Officer, Camp Doha," OIF Study Group, 10 May 2003, 1.

While lack of proper support personnel may have been a problem with some reserve component CSS units, many of which deployed as company-sized elements (and therefore, would not have had division PBO and battalion S-4 personnel along to assist them), it seems difficult to believe that it was a major factor for the larger active-duty units. But regardless of cause, it is clear that the difficulty in getting STAMIS systems from across the Army to interface with each other was a major stumbling block to the smooth functioning of the Class IX supply system in theater.

Due to the problems with getting STAMIS systems to work, many units reverted to manual procedures, both before and during the war. According to the OIF Study Group's Maintenance Assessment Summary, "Units at all levels resorted to manual procedures to order repair parts. Since the operation of STAMIS systems was spotty at best, units physically exchanged floppy disks with support units in order to order parts, or filled out DA 2765 [manual requisition] cards and presented the card to the warehouse. This practice caused the units' support soldiers to travel great distances just to order parts, tying up personnel and equipment."[197]

In-Transit Visibility

Even a cursory reading of OIF AARs shows that in-theater asset visibility was seriously flawed and often non-existent during OIF. According to the 3ID AAR, "The division has not had ITV of forward moving supplies. The lack of this visibility has had a negative impact on the DREAR [Division Rear CP] and DISCOM's ability to support its division customer base. It appears that corps MCTs [Movement Control Teams] are not properly integrated with corps and theater supply support activities (SSAs). This has handicapped their ability to capture and forward ITV information regarding the movement of supplies to the division. The lack of consistently dependable communications systems has also played a role in this lack of ITV."[198] Major Ryan of the 101st Division DMMC stated: "In-transit visibility of supplies was non-existent. RF tags and

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[197] "Field Collection Team CSS Maintenance Assessment (Summary)," OIF Study Group, 2.
[198] "3ID AAR," 207.

interrogators didn't work."[199] The 4ID DISCOM commander said much the same thing: "In-

transit visibility is broken. Had the tools but they were not in place. Tracking was lost for

visibility purposes at LSE Cedar when loads were transferred. . . . the unit survived using MTS

for supply visibility and tracking."[200]

Problems identified by the GAO in their preliminary report on OIF logistics included "a

backlog of hundreds of pallets and containers of materiel at various distribution points due to

transportation constraints and inadequate asset visibility, . . . [and] a discrepancy of $1.2 billion

between the amount of materiel shipped to Army activities in the theater of operations and the

amount of materiel those activities acknowledged they received."[201] As described in the GAO

report,

> DOD did not have adequate visibility over all equipment and supplies transported to,
> within, and from the theater of operations in support of OIF. For example, although the
> U.S. Central Command issued a policy requiring, whenever feasible, the use of radio
> frequency identification tags to track assets shipped to and within the theater, these tags
> were not used in a uniform and consistent manner. In addition, units operating in the
> theater did not have adequate access to, or could not fully use, DOD's logistics and asset
> visibility systems in order to track equipment and supplies because these systems were
> not fully interoperable and capable of exchanging information or transmitting data over
> required distances. Furthermore, DOD and military service personnel lacked training on
> the use of radio frequency identification tags and other tracking tools, which also
> adversely affected asset visibility.[202]

Certainly, the communications and data connectivity problems already described would

contribute to the inability of units to "access, or fully use, DOD logistics and asset visibility

systems." Dr. Trogdon of the Center for Military History points out another flaw in the

application of ITV technology:

> [A]lthough radio frequency tags helped monitor containers, vehicles, and pallets, once the
> containers were opened or the pallets broken down into smaller pieces, the systems data
> base could no longer track the supplies. Tracking from the departure locations within the
> United States and Europe worked well, but once in Kuwait, the system quickly lost the
> capability to monitor the contents of the container. Additionally, not all containers could

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[199] Campbell, "MAJ Ryan interview, 3.

[200] Campbell, "COL Rentz interview," 1.

[201] GAO-04-305R, *Defense Logistics During OIF*, 2.

[202] Ibid., 3.

be scanned since not all areas had mobile teams with the appropriate equipment. Instead of waiting for scanning, units opened containers and distributed the supplies, so in-theater asset visibility suffered."[203]

Clearly, the problem of losing visibility when a pallet or container is split into individual components would be less of a problem if it were destined for only a single unit or SSA. However, when one recalls the sort of chaotic dumping of mixed pallets at forward logistics sites described previously, combined with the urgency with which many repair parts were needed, it is hardly surprising that units often did not wait to properly scan pallets before distributing their contents.

Additionally, it appears that ITV enablers such as RF tags, RF tag interrogators, and portable bar code readers were frequently either unavailable or inadequately used. A report on ITV produced by the U.S. Army Combined Arms Support Command indicates that RF tags were often not installed on loads or else had incomplete data written to them. RF interrogators often broke and could not be readily repaired in theater, and portable RF readers were not available. Furthermore, many supply routes and logistics sites within Iraq did not have RF interrogators installed until well after the end of major combat operations.[204] It also appears that some units failed to sufficiently emphasize use of the enablers that they did have. A team examining logistics operations in Kuwait and Iraq during the summer of 2003 reported that each SSA, on average, was processing 1500 receipts a day *manually* because they had not brought Portable Data Collection Devices (PDCD) to the theater.[205]

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[203] Trogdon, 19-20.

[204] U.S. Army Combined Arms Support Command OIF Distribution Rock Drill, "In-transit Visibility"[slide presentation], Fort Lee, VA, 9-11 March 2004, slides 1-2, 5-6, and 10; available from https://www.cascom.army.mil/cssbl/PRIVATE/Rock/Products.asp; Internet; accessed 19 March 2004.

[205] CW4 Paul Hodson, et al., "The DM Team Visits the Theater to Assess Distribution Organizations in Support of OIF," *Army Distribution Management Newsletter,* Fall 2003, 4; available from https://www.cascom.army.mil/ADM/PRIVATE/DM.htm; Internet; accessed 16 March 2004.

Authorized Stockage Lists (ASL) and Prescribed Load Lists (PLL)

In contrast to the aspects of the Class IX supply system discussed thus far, ASLs and PLLs seem to have been, for the most part, a success story. Account after account refers to them as the only source of repair parts other than cannibalization, and a major factor in enabling units to keep their equipment moving forward. However, in many cases this success did not come without significant extra effort on the part of unit personnel. In addition, there are two distinctly different categories of ASL/PLL experience that need to be considered: units that brought their own equipment and repair parts stocks from home station, and those who drew them from Army pre-positioned equipment stocks (APS). The latter experienced some significant additional challenges.

ASL/PLL for units drawing APS equipment

Army Pre-positioned Stocks are sets of equipment and supplies stored at various locations throughout the world, both ashore and on ships. Their purpose is to speed response time by eliminating the need for early deploying units to bring all of their equipment from home station. Ideally, with APS the military only needs to deploy troops and a small amount of additional equipment by air to the area of conflict. Once there, the troops link up with the pre-positioned equipment and supplies, and are quickly ready for combat.[206]

Prior to OIF there were four main APS sets overseas, numbered 2 through 5. (The APS-1 designation was used for sustainment stocks and certain special equipment sets held in CONUS.) Three of the four sets were land based: APS-2 in Europe, APS-4 in Korea, and APS-5 in the Persian Gulf. The fourth set, APS-3, was kept on ships based at Diego Garcia in the Indian Ocean and at Guam in the Pacific. APS-5 was divided into two parts: APS-5K in Kuwait and APS-5Q in

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[206] U.S. General Accounting Office, GAO-04-562T, *Military Pre-positioning: Observations on Army and Marine Corps Programs During Operation Iraqi Freedom and Beyond,* by William M. Solis, 24 March 2004, 1; available from http://www.gao.gov/cgi-bin/getrpt?GAO-04-562T; Internet, accessed 30 March 2004.

Qatar. Altogether, APS included eight maneuver brigade equipment sets, a division base set (in APS-5Q), corps and theater support base sets (in APS-3), and various sustainment stocks. APS-3, -5K, and -5Q each contained one maneuver brigade equipment set.[207]

For OIF, the Army used nearly all of APS-3 and APS-5.[208] Among the major units drawing APS equipment were 3ID and elements of the 24th and 101st CSGs.

Although 3ID relied heavily on APS equipment, they did deploy about 30 percent of their own home station equipment. This included all of the equipment belonging to the air defense, military intelligence, and signal battalions, as well as key C2 vehicles that weren't available from APS.[209] In contrast to most OIF units, the division's 2d BCT arrived in Kuwait in the fall of 2002 as part of what was referred to as a CONUS Contingency Response Force (CCRF) rotation. They drew APS equipment and remained in Kuwait until the start of the war. They therefore had more than four months in-country to resolve any problems with the APS equipment and repair parts stockpiles they received. As we shall see, this gave them a significant advantage over later-arriving units. The remainder of the division deployed between 1 January and 30 January 2003.[210]

According to the GAO, during OIF, "parts inventories contained in the pre-positioned stocks were not sufficient to meet the needs of the units that relied on them."[211] A shortage of spare parts in the Army's pre-positioned stocks had been a long-standing problem. In 2001, the GAO had reported that the Army had on hand only about 35 percent of stated requirements for pre-positioned spare parts. At that time, the levels of ASL/PLL fill for the brigade set in Qatar were in the 13 to 19 percent range, while the division base elements in Qatar were at zero percent ASL and PLL fill. The brigade set afloat was relatively healthy with a fill of about 60 percent, but

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[207] U.S. Department of the Army, FM 100-17-2, *Army Pre-Positioned Land* (Washington, 1999), 1-3 to 1-6.
[208] GAO-04-562T, *Military Pre-positioning Programs During OIF,* 11-13.
[209] Interview of LTC Melinda Woodhurst by the author, 15 April 2004. See also Campbell, "MAJ Yahn interview," 1.
[210] "3ID AAR," 45, and E-mail message from LTC Melinda Woodhurst to the author, 25 April 2004. The deployment sequence was 3d BCT, then the MSB and Aviation Brigade, and finally, 1st BCT and division troops.
[211] GAO-04-305R, *Defense Logistics During OIF,* 5.

the corps and theater support sets had ASL and PLL fills ranging from 30 percent down to zero. In March 2002, the Army staff directed immediate action to fix the shortages and provided $25 million to support the effort.[212]

The GAO report states that, "By the time the war started in March of 2003, the fill rate had been substantially improved but significant shortages remained. The warfighter still lacked critical, high-value replacement parts like engines and transmissions. These articles were not available in the supply system and could not be acquired in time."[213] The GAO report goes on to say that "The Army's plan to mitigate this known risk was to have the units using the pre-positioned sets . . . bring their own high-value spare parts in addition to obtaining spare parts from non-deploying units."[214]

Prior to OIF, there were two separate sets of ASL in Kuwait, both of which were stored by the civilian contractors at Camp Doha. One of these, designated W40, belonged to APS-5, and was intended to support the APS-5K maneuver brigade equipment set. The other, designated W41, belonged to ARCENT-Kuwait, and was intended as a GS/theater-level stockpile. As indicated by the 2001 GAO report mentioned above, ASLs for the remainder of APS-3 and APS-5 apparently existed only partially, if at all. According to LTC Woodhurst, the 3ID G-4, the shortages were supposed be filled from war stocks held in CONUS.[215]

The 3d Infantry Division arrived expecting to have ASLs available for all three of its BCTs. As described by LTC Woodhurst, "We were supposed to get an ASL for all three BCTs, [however], we got only one: W40."[216] That took care of 2d BCT, but left the other two without. When the money to purchase the ASLs for the other two BCTs wasn't immediately forthcoming, the Coalition Forces Land Component Commander (CFLCC) directed that the ARCENT-Kuwait

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[212] GAO-04-562T, *Military Pre-positioning Programs During OIF,* 8-9.
[213] GAO-04-562T, *Military Pre-positioning Programs During OIF,* 9.
[214] Ibid.
[215] Interview of LTC Melinda Woodhurst by the author, 5 August 2003.
[216] E-mail message from LTC Melinda Woodhurst to the author, 25 April 2004.

ASL (W41) be converted to ASLs to fill APS shortages.[217] The 3ID AAR states that "Army

Materiel Command (AMC) had not requested and Department of the Army (DA) had not released

the Class IX ASL stocks . . . This single mistake cost the division upwards of 45 days in defeating

the bureaucracy involved in the operational project stock management, and then to receive,

inventory, configure, and upload repair parts in the [FSB] maintenance companies."[218]

If that seems confusing, it was apparently equally so on the ground. As reported by the

703d MSB, "The W40 ASL was mixed in with other ASLs, making the draw very confusing. The

ASL was not configured to move. Transporting the ASL was a huge problem. The number of

platforms needed to move the warehouse far exceeded the division's capability. Corps and

contracted trucks were not available to move the ASL."[219]

Within 3ID, many units had a difficult time determining exactly what repair parts would

be provided with their APS ASL and PLL. Consequently, some units ended up bringing their

home station PLL, while others did not. Upon arrival in Kuwait, some units found that the PLL

and ASL they received were "not viable for combat operations."[220]

For example, 4-64 Armor, which arrived in November 2002 with 2d BCT, did not bring

its home station PLL and found that "the APS PLL was inadequate for combat sustainment. There

were no LRUs [line-replaceable units], seals, or other parts needed to repair vehicles that had

been in long-term storage, causing the unit to expend great effort readying the APS equipment for

training."[221] Fortunately, the battalion was not required to go directly into combat. The unit

reported using the time available before the war to build its PLL from 470 lines to over 2500.[222]

(Recall that under current Department of the Army rules, PLL is supposed to be limited to 150

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[217] Ibid.
[218] "3ID AAR," 48.
[219] 3d Infantry Division DISCOM, "3ID Support Operations AAR," OIF Study Group, nd, 3.
[220] "Field Collection Team CSS Maintenance Assessment (Summary)," OIF Study Group, 1.
[221] CW4 Campbell, "CPT Thomson interview," 1. "Line-replaceable unit" is a term for equipment components that, when defective, are not repaired at unit level, but simply replaced and evacuated to a higher level of maintenance for repair.
[222] Ibid.

lines per unit. Even if each of the battalion's four companies had totally different items on their PLL, that would still only equate to a total of 600 lines permitted for the battalion.)

The Squadron Maintenance Technician for the 3-7 Cavalry, which deployed in late January, reported that "The PLL and ASL that was drawn from the APS was full of useless items that a unit would not immediately require in combat. Additionally, the unit did not have enough transportation assets to move it all, so they took the items that were deemed necessary . . . and left the rest at Camp New York."[223]

The 3ID's 3d BCT reported that they did not deploy with their home station repair part stocks, under the false impression that sufficient stocks would be available in Kuwait. Upon arrival, they found that, as already described, the contractor-operated storage site had only enough supplies on hand to support one BCT.[224] The 3d BCT's 317th Engineer Battalion's AAR stated that this was a major friction point during later combat operations. During the initial phases of reception, staging, onward movement, and integration (RSOI), the battalion reported that Class IX was critically short, and not until one month into the RSOI process was Class IX flow established and the battalion able to fill its PLL. Once combat operations started, as with nearly all other units, the battalion found that the Class IX flow ceased and they were forced to resort to cannibalization. They reported that had combat operations "continued at a sustained pace for two to three additional weeks, the engineer fleet could possibly have been close to combat ineffective due to lack of Class IX."[225]

The 3d FSB, supporting the 1st BCT, reported that they arrived in Kuwait expecting to receive a number of items that turned out not to be available. They expected to receive an ASL of 2500 lines, but only received 800 lines, and were down to less than that when they crossed the line of departure. They also reported that parts, including major assemblies such as engines and

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[223] CW4 Michael Campbell, "CW4 Rocky Yahn, Squadron Maintenance Technician, 3/7 Cav," OIF Study Group, 18 May 2003, 2.

[224] 3d Brigade Combat Team, 3d Infantry Division. "3ID 3BCT Operation Iraqi Freedom After Action Report," OIF Study Group, 23 April 2003, 64.

[225] Ibid., 57.

transmissions, started coming in heavily once the unit departed Camp New York for its final pre-LD attack positions, but by that point they had no available transportation assets to carry them.[226] Similarly, the 24th CSG reported receiving an ASL of 2000 lines rather than the 4000 they expected.[227]

In contrast to most units, the 1st Battalion, 9th Field Artillery seemed quite pleased with the PLL they received. Not surprisingly, they arrived as part of 2d BCT, and thus were the first artillery battalion in line for the APS draw. As described in the battalion's AAR, "Once the battalion closed in Kuwait the battalion had 859 lines of PLL. This is much more than at home station. The PLL drawn was fantastic and covered a large amount of the problems we encountered."[228] This robust PLL was reported to be largely based on demand analysis from artillery batteries that had participated in previous Intrinsic Action exercises in Kuwait. However, following a three-week exercise that 2d BCT conducted in December 2002, 1-9 FA concluded that they needed to increase their PLL even more, based on the difficulty that the FSB experienced in providing support during frequent moves.[229]

Another factor that contributed to ASL/PLL problems was the difference between units' home station equipment and what they received from APS. For example, at home station, 3ID had M113A3 series vehicles and the latest Light-Medium Tactical Vehicle (LMTV)-series 2-1/2 ton and 5 ton trucks. However, the APS contained M113A2 series vehicles and old M35A2 2-1/2 ton and M800-series 5 ton trucks.[230] This meant that the plan referred to by the GAO report to have units "bring their own high-value spare parts"[231] to fill shortages in the APS ASLs and PLLs wasn't entirely feasible. None of the parts that 3ID had at home would have fit the old-model

[226] Jackson, "MAJ Priatko and MAJ Norman interview," 1.
[227] Jackson, "MAJ Smith, et al. interview," 3.
[228] 1st Battalion, 9th Field Artillery, "1-9 FA Bn AAR," OIF Study Group, 29 Apr 03, 1.
[229] Ibid. "Intrinsic Action" (later renamed "Desert Spring") was a recurring series of exercises, beginning in the early 1990s and continuing nearly until OIF, in which a reinforced battalion/task force would deploy to Kuwait, draw APS equipment, and spend several months conducting maneuvers and live fire exercises.
[230] Campbell, "CW4 Yahn interview," 2, and Campbell, "CPT Thompson interview," 1.
[231] GAO-04-562T, *Military Pre-positioning Programs During OIF,* 9.

trucks, and only the more basic M113A3 parts would work on the M113A2s. Likewise, the vehicles that 3ID *did* bring from home station were unable to rely on the APS PLL and ASL. Additionally, the mixed fleet of old and new vehicles significantly increased the number of parts lines that units had to attempt to stock and transport.

For example, 1-9 FA reported having difficulty maintaining their home station M577A3s upon arrival, and needing more than a month to come up with a good ASL to support them.[232] (Fortunately, as part of the early-arriving 2d BCT, they had the time available.) The 1st Battalion, 3d Aviation reported having one of their LMTV trucks sit in Kuwait with a cracked engine for the entire war because there was no LMTV ASL in theater.[233] This, of course, was at a time when every transportation platform was desperately needed.

ASL/PLL for non-APS units

The ASL/PLL situation was much simpler for units that did not draw APS equipment. Not only did they avoid the confusion over what exactly their ASL or PLL would contain, since they brought their own, but they also avoided the problems caused by having a mixed fleet of old and new equipment. It appears that many units took the precaution of augmenting their ASL/PLL before deployment. The 4ID DISCOM commander reported that before leaving home, the division "conducted good ASL reviews to ensure they would have the right stock and that the stock would last at least 30 days."[234] In actuality, it turned out that their ASL had to last approximately 50 days before the flow of Class IX became at all regular. He stated that despite the division having put the equivalent of one and one-half years of peacetime mileage on its equipment in six weeks, their ASLs were still well stocked as of 26 May 2003, with only about 20 percent of their ASL lines being at zero-balance.[235]

[232] 1st Battalion, 9th Field Artillery, "1-9 FA Bn AAR," 2.
[233] 1st Battalion, 3d Aviation, "1-3 Avn After Action Review," 30.
[234] Campbell, "COL Rentz interview," 2.
[235] Ibid.

The Support Operations Officer for the 4ID's 4th FSB reported that his unit had expected little sustainment to be available in theater, so they had increased their ASL to 2875 lines and uploaded it into shipping containers for ease of transport. The unit relied entirely on what it had brought and what it could scrounge as late as the last week of May, when repair parts began to flow to the unit. He stated that although Class IX resupply had been a continuous problem, the unit's work on the ASL at home station contributed to a zero balance rate of only 27% as of 27 May 2003. He also mentioned that before deploying, the unit bought extra spare tires so vehicles would not have to be abandoned due to flat tires.[236]

Miscellaneous ASL/PLL issues

Most of the corps-level and higher CSS units fell somewhere between the two extremes in their ASL/PLL experience. The 24th and 101st CSGs, in particular, had a number of units that drew APS equipment, and thus experienced many of the same frustrations as 3ID. In addition, nearly all of the larger support units had a mixture of active and reserve component units, with varying vintages of equipment, so they faced the problems posed by mixed fleets. In addition, in many cases their subordinate units were not the same ones they had expected to go to war with, which often caused any prior planning for particular equipment types to go for naught. For example, in the 101st CSG, most of the assigned units had no previous habitual relationship with the group. As a result, due to equipment differences, peacetime ASLs often did not match wartime support requirements.[237]

An additional challenge for the COSCOM and TSC was that some reserve component units apparently did not deploy with their ASLs or PLLs. The Support Operations Officer of the 101st CSG stated that the individual states owned the National Guard supply units' ASLs and, in

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[236] CW4 Michael Campbell, "MAJ Darren Werner interview, Support Operations Officer, 4th FSB," OIF Study Group, 27 May 2003, 1-2.
[237] Kelley and Campbell, "COL Dolnish and Staff interview," 2-3.

the case of at least some units assigned to the 101st CSG, would not let the units deploy with them.[238] This made the units incapable of performing their supply mission upon arrival.[239]

Overall, ASL and PLL seems to have been an OIF success story, particularly compared to the rather abysmal performance of most of the rest of the in-theater Class IX supply system. However, it appears that ASLs drawn from APS were notably less effective than ASLs brought from home station. Charts included in a Combined Arms Support Command report show that for divisions and other major units that brought their own ASLs, the "accommodation rates" during OIF were nearly as good as during the previous six months at home station. ("Accommodation rate" refers to the ability of an ASL to provide a requisitioned part, expressed as a percentage.) The 101st Airborne Division, 4ID, 82d Airborne Division, and 1AD all had home-station accommodation rates of around 40 percent. Their OIF accommodation rates were all within six percentage points (or better) of their home-station rates, and in the case of 4ID, the OIF rate was actually slightly better that at home station.[240]

In contrast, all three of 3ID's BCTs had home-station accommodation rates of nearly 50 percent, while their OIF rates were dramatically lower. Not surprisingly, the early-arriving 2d BCT had the best OIF rate, at 24 percent, while the other two BCTs scored around 17 and 12 percent.[241] It is not clear from the charts whether the relatively greater time that that 3ID spent on the move in comparison to later arriving units could have anything to do with their lower accommodation rates. Certainly, however, much of the difference is due to the problems of inadequate ASLs and mixed fleets already discussed. It seems clear that there is much room for improvement in the management of APS repair parts stocks. Another thing not clear from the above data is to what extent the similarity between home-station and OIF accommodation rates

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[238] Campbell, "LTC Mullen interview," 1.
[239] "Field Collection Team CSS Maintenance Assessment (Summary)," 7.
[240] CASCOM OIF Distribution Rock Drill, "Class IX"[slide presentation], slide 11.
[241] Ibid., slide 12.

for units that deployed with their own ASL might be due to sanctioned or unsanctioned increases to their ASLs prior to deployment.

U.S. Marine Corps and British Class IX Supply Operations

One question that might arise from an examination of the U.S. Army's Class IX supply problems in OIF is how the Army's experience compared to that of the other major coalition ground forces, namely the U.S. Marine Corps and the British Army. One does not have to read very far at all to get the impression that the Marine Corps had problems nearly identical to the Army's. An article by the leadership of the 1st Force Service Support Group (FSSG)[242] states:

> Demand-based pull logistics, specifically Class VIII (medical) and Class IX, was clearly inadequate. A 30-plus-year-old mainframe [computer]-based supply system, significant communications shortfalls, lack of in-transit visibility, and the tyranny of distance caused unit supply officers to lose faith in the supply system. Many either continually resubmitted requisitions for the same parts and items, which in turn clogged the distribution system, or bypassed the supply system altogether and reverted to e-mails and spreadsheets, most times with insufficient information to effect timely and responsive action. The lack of in-transit visibility and a low priority for demand-based requisitions in the ground transportation order further exacerbated the problem.[243]

Adding to the Marines' difficulty was the fact that Marine units did not even all use the same supply system. The west coast-based I Marine Expeditionary Force (I MEF), the main Marine headquarters for OIF and the parent headquarters of 1st FSSG, used a system called Asset Tracking Logistics and Supply System (ATLASS) I. The east-coast based II MEF used a different system called ATLASS II. Since the II MEF's 2d FSSG was the base around which the Marines' theater-level logistics structure, referred to as a Marine Logistics Command (MLC), was built, the potential problems should be obvious. In the words of the 1st Marine Division's G-4, "OIF has shown that there is no such thing as a unified Marine Corps supply system. As units from

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[242] Each Marine division has an associated FSSG, which combines the roles of the Army's DISCOM and COSCOM.

[243] Commanders and Staff of 1st FSSG, "Brute Force Combat Service Support: 1st Force Service Support Group in Operation IRAQI FREEDOM," *Marine Corps Gazette,* August 2003, 38.

throughout the Marine Corps came together, it was immediately apparent that no standard method of requesting or conducting resupply exists."[244]

The results seem to have been nearly identical to the Army's experience. As one Marine OIF participant described it, "Combat forces were reduced to foraging for supplies (repair parts in particular) to sustain momentum. . . . Horror stories abound of *available* critical repair parts being somewhere between the Kuwaiti aerial/seaport of debarkation and the frustrated supported unit in Iraq – as the supplies remained locked in the logistics chain."[245]

The British experience does not seem to have been much better, despite the fact that British units moved far less and had drastically shorter lines of communications than their American counterparts. (The main British ground element, the 1st Armoured Division, spent most of the war besieging the city of Basra, roughly 50 kilometers from the Kuwaiti border. When Basra finally fell on 7 April, the U.S. Army and Marines were already fighting in Baghdad, more than 500 kilometers from Kuwait.[246]) According to one recent book, "British preparations exhibited some considerable deficiencies, particularly in logistics. . . . Like many of their American counterparts, some British logistics had moved to a just-in-time mentality, which one British officer described as *'definitely not'* a success."[247]

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[244] Lieutenant Colonel John J. Broadmeadow, "Logistics Support to 1st Marine Division During Operation IRAQI FREEDOM," *Marine Corps Gazette,* August 2003, 45.

[245] Colonel Robert E. Love, "Operation IRAQI FREEDOM – Marine Corps Logistics at Its Best?," *Marine Corps Gazette,* January 2004, 49. (Italics in original.)

[246] Murray and Scales, *The Iraq War,* 151-152 and 209.

[247] Ibid., 136-137. (Italics in original.)

CHAPTER FOUR

COMPARISON OF CLASS IX SUPPLY DOCTRINE TO OIF EXPERIENCE

This chapter will compare the Army's Class IX supply doctrine to its experience in OIF, using as a framework the principles of distribution from FM 100-10-1 and JP 4-01.4. Five of the principles are common to both publications: *centralize management*, *optimize infrastructure*, *maximize* [use of] *throughput*, *minimize forward stockpiling*, and *maintain continuous and seamless pipeline flow*. JP 4-01.4 also lists three additional principles: *velocity over mass, reduce customer wait time, and achieve time-definite delivery*.[248]

"Centralize management"

According to FM 100-10-1,

> Centralizing management is essential to efficient and effective distribution system operations. It involves the integrated end-to-end visibility and control of the distribution system capacity and distribution pipeline flow. Designated distribution managers in distribution management centers (DMCs) . . . at each . . . echelon manage distribution management operations and coordinate and synchronize movements of supplies, personnel, and unit equipment. Materiel management and movement control operations at each echelon are synchronized under the . . . DMC.[249]

A DMC *was* formed at the TSC level to coordinate the efforts of the theater MMC, movement controllers, and transporters. However, it seems to have been less effective than it could have been. Colonel Joseph Walden, who ultimately became the TDC manager, felt that the DMC needed actual command authority over the various elements it was attempting to coordinate. As he put it, "Creating a staff DMC did little more than create another layer of bureaucracy."[250] It is indisputable that theater distribution was badly flawed and that "integrated end-to-end visibility and control" of the distribution pipeline did not exist. How much of this had anything to do with the DMC is difficult to say, however. Clearly, given the challenges of

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[248] FM 100-10-1, 3-4 to 3-5; and JP 4-01.4, I-7 to I-8.
[249] FM 100-10-1, 3-4 to 3-5.
[250] Walden, "Distribution Organizations in Support of OIF," 2. (Italics added.)

resource shortages, distance, connectivity, and late arrival of CSS units, the DMC was not set up for success.

"Optimize infrastructure"

JP 4-01.4 states that optimizing the distribution system infrastructure "requires distribution managers at each echelon to maintain visibility of the infrastructure under their control, and to acquire and reallocate physical network capabilities to meet changing requirements."[251] Clearly this did not happen consistently during OIF. The problems of communications and STAMIS connectivity and inadequate ITV enablers prevented consistent visibility of infrastructure and resources. Furthermore, the physical network capabilities available, particularly transportation assets, were inadequate from the start.

"Maximize [use of] throughput"

FM 100-10-1 defines throughput distribution as "bypass[ing] one or more echelons in the supply system to minimize handling and speed delivery forward."[252] JP 4-01.4 adds that whenever possible, "national providers should prepare resources for direct, time-definite delivery to a customer support activity in a theater." It also states that a distribution-based logistic system "emphasizes the use of containerization [and palletization] to minimize handling and maximize the throughput of resources from the sustaining base to tactical level support organizations."[253]

Clearly, this aspect of doctrine was poorly executed within the theater during OIF. As evidence, we have the multiple reports from various units [described in Chapter 3] of receiving mixed pallets of their own and other unit's parts, or of having pallets dumped randomly around the desert in forward logistics areas. We also have the report that APOEs were palletizing cargo without regard to pure SSA loads, thus increasing the workload for the already overwhelmed

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[251] JP 4-01.4, I-7.
[252] FM 100-10-1, 3-5.
[253] JP 4-01.4, I-7.

TDC. Much of the problem no doubt lay with the flawed initial planning that expected to rely on the contractor-run site at Camp Doha as the TDC. This was compounded by the various factors leading to the late arrival of the supply units that ultimately operated the TDC and the theater Class IX warehouse. Also exacerbating the problem were the inadequate communications and ITV systems that made it difficult or impossible for supply convoys to remain updated on the current locations of their destination units.

"Minimize forward stockpiling"/"Velocity over mass"

These two principles are closely related. According to JP 4-01.4, "The velocity of a distribution-based logistic system reduces the reliance on large, costly stockpiles within a theater."[254] Under this principle, pre-positioned stocks, both afloat and ashore, are supposed to provide the "minimum essential stocks required to begin operations in a theater and augment the distribution pipeline."[255]

While the overall use of APS during OIF was a success story,[256] we have seen that its Class IX component caused significant difficulty for many of the units that used it. However, this appears to have been largely a problem of execution at both the national and theater level rather than a problem with the basic concept of APS.

The usefulness of PLLs and ASLs was among the few bright spots in the OIF Class IX experience. However, units generally achieved this success to the extent that they reverted to the old supply-based logistics model of robust PLLs and ASLs. Frequently, this led to units maintaining parts stockpiles drastically larger than the rules allowed. The 3d Infantry Division's 10th Engineer Battalion exemplified this with a statement in their AAR: "We must return to a robust, demand supported Class IX PLL . . . Had we not cheated the system and developed a

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[254] Ibid.
[255] Ibid.
[256] The GAO report on use of pre-positioning during OIF states that both the Army and Marines reported that "pre-positioned stocks were a key factor in the success of OIF." GAO-04-562T, *Military Pre-positioning Programs During OIF,* 1.

robust unauthorized PLL prior to LD we would not have succeeded."[257] No doubt the necessity

for such inflated PLLs and ASLs would have been reduced had other parts of the distribution

system come anywhere close to functioning as intended by the Distribution Management (DM)

concept. Nevertheless, there are indications that Army policies reducing PLLs and ASLs may

have gone too far in recent years. Colonel Walden addressed this in an article in the Army

Distribution Management Newsletter:

> One collateral fallout of the DM program . . . was reduction in the size of ASLs, and, in some cases, elimination of PLLs. This saved the Army millions of dollars in repair parts, and in some cases the reductions were justified because of lack of demand. In most cases, however, the reductions were business decisions based on the supply system logic and the reduced *peacetime* customer wait times. The trickle down effect of the significantly reduced customer wait times also reduced the depth of the ASLs. Together these actions reduced the quickly available repair parts normally carried with the brigade combat teams.

> The swing to a just-in-time logistics system may have gone too far away from just-in-case supplies. This move from just-in-case during peacetime may have contributed to the flood of supplies coming into the theater, thus clogging the distribution system in its early stages.[258]

"Maintain continuous and seamless pipeline flow"

According to FM 100-10-1, this principle "involves the application of all other

distribution principles to produce the end-to-end continuum of a distribution system. The

integrated CSS/C2 automation and communications networks . . . provide the strategic,

operational, and tactical connectivity that allows the distribution management structure the

capability to maintain continuous and seamless pipeline flow," and the visibility of the items

within.[259]

Certainly, in OIF the in-theater distribution pipeline flow was neither continuous nor

seamless. As we have seen, the "integrated CSS/C2 automation and communications networks"

were largely ineffective, or at best, functioned at only a fraction of the needed capacity. ITV

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[257] 10th Engineer Battalion, "Operation IRAQI FREEDOM 10th EN BN AAR, " 2.
[258] Walden, "Distribution Organizations in Support of OIF," 2. (Italics added.)
[259] FM 100-10-1, 3-5.

enablers such as RF interrogators and bar code scanners were too scarce and unreliable to provide adequate pipeline visibility. Movement tracking and communications systems like MTS and DTRACS provided excellent service to the units that received them. However, their limited distribution and late fielding often reduced units' ability to achieve the systems' full potential. Above all, the shortage of trucks imposed nearly insurmountable limitations on theater distribution, regardless of how well other systems had worked.

"Reduce customer wait time" and "Achieve time-definite delivery"

These two principles are really products of properly applying all the previous distribution principles. JP 4-01.4 uses almost the same phrase in discussing each of them: "The delivery of the right item . . . to the right place at the right time."[260] Certainly, for all the reasons previously discussed, that was not the norm for Class IX in OIF.

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[260] JP 4-01.4, I-7 to I-8.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Basic Recommendations

This monograph is intended to answer the question of whether or not the Army's doctrine for Class IX supply operations needs to be revised in light of OIF experience. Despite the widespread failure of the Army's Class IX supply operations during the major combat portions of Operation Iraqi Freedom, it does not appear that doctrine itself was primarily to blame. Rather, the failures seem to have resulted from a combination of a failure to follow doctrine and a failure to field the necessary enablers that current doctrine requires for full effectiveness.

The failure to follow doctrine is seen in the late arrival of CSS assets in theater and in their overall inadequate numbers during the major combat operations phase. This is particularly true of transportation truck units, but also applies to the elements needed to run key logistics nodes within Kuwait and to control and track movement on the lines of communication. This failure to follow doctrine cannot *necessarily* be considered a mistake. As pointed out in the introduction, the major combat operation portion of OIF was a clear success, whatever the problems with Class IX resupply. Aside from the Secretary of Defense's evident desire to place restraints on the size of the ground forces employed for OIF, there are other arguably valid reasons to have delayed the flow of CSS units into theater. These might include a desire to minimize the buildup while diplomatic efforts to gain international support were still underway, a desire to surprise the Iraqi leadership by launching a ground offensive sooner than the coalition's logistics posture indicated was likely, or simply a desire to delay reserve unit mobilizations until after the Christmas holiday season. Whatever the motivations, those who shaped the OIF logistics plan can make the case that it was a calculated risk that succeeded. It is always wise to avoid *unnecessary* risks, however, so planners and decision makers who might contemplate such a

course of action in the future need to understand very clearly the potential costs and dangers.

There are numerous examples of the failure to fully field the enablers that current logistics doctrine requires for full effectiveness. These include a primary data communications system less cumbersome than MSE, sufficient numbers of digital C2 systems for CSS units, and sufficiently numerous and robust Automated Identification Technology (AIT)/In-transit Visibility (ITV) systems.

Ideally, whatever communications system replaces MSE should be capable of operating on the move. In the absence of that capability, a system such as VSAT, capable of fairly rapid set-up and not dependent on a chain of similar systems, would still be a huge improvement over MSE. Until data communications systems become more flexible and reliable, automated supply, maintenance, and ITV systems cannot be fully effective in mobile combat operations because individual nodes cannot readily share data.

Digital C2 and ITV systems such as FBCB2/BFT, MTS, and DTRACS were highly successful in OIF. They need to be fully fielded in CSS units. Longer term, it would be desirable for the various functions needed by combat and CSS units to be combined into a single system, or at least for the various systems to be able to communicate with each other.

AIT/ITV systems such as RFID technology and bar code readers must be made more reliable and be fielded more widely to forward units. An attitude change is also needed, so that such devices are seen as integral parts of a unit's operations in all environments. Efforts in this area are already underway. For example, a new DOD policy will require suppliers to place RFID tags on the lowest possible part, case, or pallet packaging by January 2005.[261]

Additional Recommendations

Increase ASL and PLL size. The Army needs to reevaluate its policies governing the size of ASLs and PLLs. Rather than being based on peacetime customer-wait times, ASLs and PLLs

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[261] "DOD Policy Mandates RFID Use by 2005," *Army Logistician*, January-February 2004, 1.

need to be primarily based on what units will require to sustain themselves during the early stages of combat or other contingency operations while a fully-functioning distribution pipeline is still being established. In addition, some solution must be found to the reported problem of reserve component maintenance units not being allowed to deploy with their home-station ASLs.

Make the follow-on to current STAMIS systems a joint system. A DOD-wide system called the Global Combat Support System (GCSS) is currently under development. As described by FM 100-10-1, CGSS is an "integration and interoperability initiative to ensure [joint] interoperability across CSS functions, as well as between CSS and C2 functions."[262] The Army's portion of GCSS, known as GCSS-Army, will eventually replace current STAMIS systems such as ULLS, SARSS, and SAMS. The new supply system needs to be the same for all services. At a minimum, the Army and Marine Corps must use the same system, so that the two services can readily share spare parts and other supplies. During OIF, a variety of Army units supported I MEF.[263] Clearly, it would be desirable for such units to be able to integrate into the supply system of the supported organization.

Streamline and practice procedures for networking STAMIS systems. Although such STAMIS systems as ULLS, SARSS, and SAMS will eventually be replaced by GCSS-Army, the current systems are likely to remain in service for some time. To avoid the sort of STAMIS integration problems experienced by so many units in OIF, the procedures for integrating STAMIS boxes into new organizations and theaters must be streamlined and then rehearsed on a regular basis. As some observers pointed out, these procedures are performed regularly at the National Training Center.[264] All units need to be proficient at them.

Fill pre-positioned ASLs/PLLs, align units more closely with APS unit sets, and exercise the APS system more. Given the importance of Army pre-positioned stocks to the Army's ability

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[262] FM 100-10-1, 6-09 to 6-11.
[263] Commanders and Staff of 1st FSSG, "Brute Force CSS," 34. Army units operating in support of I MEF included transportation, military police, bridging , and nuclear, biological and chemical (NBC) units.
[264] 1st BCT, 3ID, "RSOI and Pre-Combat Lessons Learned," 1.

to respond rapidly to crises, the practice of having APS ASLs and PLLs reliant on war stock

repair parts stored in CONUS seems to be of dubious wisdom. Even if the parts are requisitioned

in time, which does not seem to have been the case with 3ID's OIF deployment, they must still

compete with scarce strategic lift during a crisis. APS ASLs and PLLs need to be filled, and

stored with the equipment they support. As pointed out by the GAO report on pre-positioned

equipment use in OIF, APS needs to be resourced commensurate with its priority.[265]

Another improvement recommended by the GAO report is to establish "a closer

relationship between operational units and the pre-positioned stocks they would be expected to

use in a contingency."[266] This would be similar to what the Marine Corps does with its Maritime

Pre-positioning Squadrons. This should include exercises in which APS equipment is actually

used. This has been done in the past, but primarily with equipment in Kuwait and Korea.[267] A

closer relationship between units and APS would help eliminate the kind of surprises some 3ID

units experienced regarding the types of equipment and the quality of the ASLs and PLLs they

received.

Give the Theater Distribution Management Center (DMC) command authority over

materiel managers, transportation managers, and transportation assets. As pointed out by COL

Joseph Walden, the staff DMC, as used in OIF, did little more than create another layer of

bureaucracy. His recommendation is that the DMC should work directly for the TSC commander,

and that it should have command authority over the Theater Materiel Management Center

(MMC), the Theater Movement Control Agency (MCA), the Theater Transportation Command

(TC), and the Theater Distribution Center (TDC).[268]

Make the Theater Support Command (TSC) a joint organization. Rather than the TSC

being a purely Army organization, leaving the Marines to cobble together their own theater level

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[265] GAO-04-562T, "Military Prepositioning Programs During OIF," 15.
[266] Ibid.," 14.
[267] Ibid.
[268] Walden, "Distribution Organizations in OIF," 2

support organization from a spare FSSG, the TSC should be a joint organization from the start. Such a Joint Theater Support Command (JTSC) would report directly to the theater commander and would be responsible for all logistics support provided by U.S. forces in the theater.[269]

Conclusion

The failure of the Class IX supply system during Operation Iraqi Freedom did not result from flaws in the Army's doctrine. Rather, the breakdown of the Class IX theater distribution system resulted from two main causes outside of doctrine. The first of these was the failure to deploy CSS forces early enough and in sufficient numbers to support an operation the size of OIF. The second was the Army's failure to field adequate numbers of the enablers required for a distribution-based logistics system to work, particularly such items as adequate long-range communications systems, Automated Identification Technology (AIT) systems, and In-transit Visibility (ITV) systems. For its Class IX supply system to succeed in future operations, the Army must field the necessary enablers for distribution-based logistics, make certain other improvements to Class IX-related systems and policies (described above), and ensure that adequate logistics forces are deployed for future contingency operations.

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[269] For a discussion of this concept, see Lieutenant Colonel Gary R. Engel, "Joint and Combined Theater Logistics – The Future Reality*," Army Logistician,* May-June 1999, 36.

APPENDIX -- GLOSSARY

AAR – After-action review
ACE – Armored combat earthmover
AD – Armored Division
AWCT – Average customer wait time
ADM – Army distribution management
AMC – Air Mobility Command or Army Material Command
AO – Area of operations
AOE – Army of Excellence
APA – Army pre-positioned afloat
APOD – Air port of debarkation
APOE – Air port of embarkation
APS – Army pre-positioned stocks
AR – Army Regulation
ARCENT – Army component of CENTCOM
ASL – Authorized stockage list
ASB – Aviation support battalion
ASG – Area support group
ATLASS – Asset tracking logistics and supply system
AVLB – Armored vehicle-launched bridge

BCT – Brigade combat team
BFT – Blue force tracker
BFV – Bradley fighting vehicle

CASCOM – [U.S. Army] Combined Arms Support Command
CENTCOM – [U.S.] Central Command
CCRF – CONUS contingency response force
CCP – Consolidation and containerization point
CFLCC – Coalition Forces Land Component Commander
CMCC – Corps movement control center
CMMC – Corps materiel management center
CONUS – Continental United States
COSCOM – Corps support command
CP – Command post
CRSP – Central receiving and storage point [at Camp Doha, Kuwait]
CS – Control station [version of MTS]
CSB – Corps support battalion
CSG – Corps support group
CSS – Combat service support
CWT – Customer wait time
C2 – Command and control

DCSLOG – Deputy Chief of Staff for Logistics
DCB – Dollar cost banding [ASL term]
DDC – Defense distribution center
DISCOM – Division support command
DM – Distribution management
DMC – Distribution management center

DME – Distribution management element
DOD – Department of Defense
DODAAC – Department of Defense Activity Address Code
DOS – Days of supply
DS – Direct support
DTO – Division transportation officer
DTRACS – Defense transportation reporting and control system

EOQ – Economic order quantity [ASL term]

FA – Field artillery
FBCB2 – Force XXI Battle Command, Brigade and Below
FLB – Forward logistics base
FSB – Forward support battalion
FSSG – Force service support group
FM – Field manual

GCSS – Global combat support system
GCSS-Army – Global combat support system – Army
GPS – Global positioning system
GS – General support
GSA – General Services Administration

HET – Heavy equipment transporter
HMMWV – High-mobility multi-purpose wheeled vehicle

ID – Infantry division

JP – Joint Publication

LOC – Line(s) of communication
LD – Line of departure
LRU – Line replaceable unit
LSA – Logistics support area
LSE – Logistics support element
LSB – Logistics support base

MCA – Movement control agency
MCO – Movement control officer
MCT – Movement control team
MEF – Marine expeditionary force
MLC – Marine logistics command
MMC – Materiel management center
MP – Military police
MRO – Materiel release order
MSB – Main support battalion
MS – Mobile station [version of MTS]
MSC – Military Sealift Command
MTMC – Military Traffic Management Command
MTOE – Modification table of organization and equipment

MTS – Movement tracking system

NTC – National Training Center

OCONUS – Outside the continental United States
OIF – Operation Iraqi Freedom
OL – Operating level [ASL term]
OMC – Optical memory card
OR – Operational readiness
OST – Order ship time

PDC – Primary distribution center
PDCD – Portable data collection device
PLL – Prescribed load list
POD – Port of debarkation
POE – Port of embarkation
POL – Petroleum, oil, and lubricants

RFID – Radio frequency identification
RO – Requisition objective [ASL term]
RSOI – Reception, staging, onward movement, and integration

S&P – Stake and platform [flatbed semi-trailer]
SAMS – Standard Army maintenance system
SARRS – Standard Army retail supply system
SASO – Stability and support operations
SDDC – Surface Deployment and Distribution Command
SL – Safety level [ASL term]
SPO – Support operations (or Support operations officer)
SSA – Supply support activity
SWA – Southwest Asia

TAV – Total asset visibility
TCMD – Transportation control and movement document
TSC – Theater support command
TDD – Time definite delivery
TF – Task force
TMT – Transportation motor transport
TRANSCOM – Transportation command

VM – Velocity management

ULLS – Unit-level logistics system
USTRANSCOM – U.S. Transportation Command

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