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14. ABSTRACT

Operation Desert Storm demonstrated that there were serious problems with asset tracking, particularly with in-transit visibility, in our logistics system. In the modern age of joint warfare, this difficulty degrades the ability of the Joint Force Commander to exercise freedom of action in prosecuting a vigorous and flexible operation.

Operation Iraqi Freedom, executed in essentially the same location twelve years later, demonstrated that there are still great difficulties with in-transit visibility. There were a variety of reasons for this continued degradation on our logistics system, including poor execution of existing doctrine, failure to integrate various logistics information systems for a common operating picture, and insufficient bandwidth to handle the load of a common logistics operating picture.

In order to resolve these difficulties, more attention must be paid to integrating logistics management into the network-centric battlefield, allowing the Joint Force Commander to exercise oversight and control of his logistics streams with much more effect.

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From Factory to Foxhole: In-Transit Visibility in Operation Desert Storm,
Operation Iraqi Freedom and Beyond

By

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A paper submitted to the faculty of the Naval War College in partial satisfaction
of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily
endorsed by the Naval War College or the Department of the Navy.

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16 May 2004

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Abstract

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joint warfare, this difficulty degrades the ability of the Joint Force Commander to exercise

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Table of Contents

INTRODUCTION

Operational logistics provides the foundation upon which combat power and the ability to exercise operational maneuver is built.[1] Without solid logistical support, the Joint Force Commander (JFC) will find it difficult to control the tempo of operations and will be forced to accept undesired pauses, often at perilously inopportune times, in order to allow his logistical support to catch up. By understanding the technical and technological limitations of a logistical system, and building planned pauses into an operation, some of these undesired effects may be minimized. Improvements in logistical systems will decrease the need for planned pauses, allowing the commander more flexibility to exercise freedom of movement and to capitalize on enemy vulnerabilities.

There have been many improvements in operational logistics which came as a result of lessons learned during Operation Desert Shield/Storm. Not the least of these improvements was the introduction of widespread, computerized information management systems, creating easier accountability, tracking and locating systems. These proved invaluable in getting people and equipment where they were needed rapidly and efficiently. Despite all these improvements, Operation Iraqi Freedom demonstrated that there are still nagging difficulties with asset visibility, particularly visibility in transit, which degrade efforts to support operational flexibility, timing and tempo. In order to resolve these difficulties, more attention must be paid to integrating logistics management into the network-centric battlefield, allowing the Joint Force Commander to exercise oversight and control of his logistics streams with much more effect. This paper will review operational logistics during these two major operations held essentially in the same place twelve years

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[1] Joint Chiefs of Staff, <u>Doctrine for Logistics Support of Joint Operations,</u> Joint Pub 4-0 (Washington, D.C.: 6 April 2000), ix, II-1.

apart, and will identify some of the logistics management problems which contributed to poor in-transit visibility (ITV), some of the solutions employed to fix them, and what future solutions may be instituted to improve operational logistics.

Operation Desert Shield/Desert Storm

Operation Desert Shield and its sequel, Operation Desert Storm, were the first major operations the United States undertook in the new Information Age. Previous operations and their accompanying logistics systems were more akin to operations during World War II. These were characterized by massive logistical efforts to mass material in the area of operations for further distribution to units needing material, accumulating sufficient quantities to last some predetermined number of days. This method has been referred to as the "metal mountain" method or sometimes the "just in case" logistics strategy. While this seems at first to be the best means of supplying and sustaining a military operation of some duration, it has some equally obvious faults.

First, there is the matter of getting such a tremendous mass of material to the area of operations. This is no mean task in itself. Strategic lift is required on a massive scale, both sealift and airlift, to transport great quantities of military equipment and material such distances in a very short amount of time. Priorities are often difficult to manage, as there is a great deal of competition between buildup and sustainment material for available lift.

Once material arrives in theater, areas have to be set up near the debarkation ports to assemble and stage the material for onward movement and distribution. These large supply staging bases present a very lucrative target to an enemy. Receiving and sorting out all the equipment, material and supplies in the staging area is also one of the more difficult tasks, particularly when coupled with the task of figuring out who it belongs to, where it should go,

when it should go, and how it is to get there. This gets to the meat of the ITV problem, which was among the more thorny problems encountered during Operation Desert Storm.

This ITV issue was exacerbated by the "metal mountain" approach to massing material in theater and the need to account for all of it. Since no Time Phased Force Deployment Data (TPFDD) existed specifically for Operation Desert Shield at the outset, estimates had to be generated based on unprioritized requirements for units and material to be shipped to the area of operations.[2] Then this material had to be staged at various embarkation ports and loaded onto ships or aircraft for transportation to the theater of operations. During Desert Storm, there were no sufficient means of tracking material which was in transit. In other words, once it was packed off to the war on a ship or aircraft, there was little that could be done to determine which container, pallet or bin a given piece of equipment or material was in. Once the ship or plane arrived and was unloaded, the logistics people in theater had to sort it out, figuring out who owned each container and piece of equipment. This was easy enough to do for the large items, but was quite time consuming and tedious for smaller packages. The material inside the shipping containers often belonged to several different commands or even different services. This required "container diving," or physically opening each container, to determine its contents. Some containers had to be opened numerous times during the conflict in order to locate specific items of importance. It was estimated after the war that some 28,000 of 41,000 containers had to be opened on arrival simply to find out what was in them.[3]

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[2] Eliot A. Cohen et al., Gulf War Air Power Survey, Vol. III, Logistics and Support, (Washington, D.C.: U.S. Air Force Dept. and Govt. Printing Off., 1993), 82.
[3] Lt. General William G. Pagonis, Moving Mountains: Lessons in Leadership and Logistics from the Gulf War, (Boston, MA: Harvard Business School Press, 1992), 206.

Following Operation Desert Storm and the redeployment of forces from theater, many of the difficulties with logistics were identified, and solutions were proposed. Some of the problems were the result of administrative management systems which had not been overhauled seriously in the years since World War II and Vietnam, specifically, the lack of ITV. Others were the result of poor execution of existing procedures for logistics management. An example of this was the lack of prioritized loading of vessels and aircraft to provide material and equipment in order of its predicted necessity for operations. Another example was the lack of priority given to the movement of combat service support personnel into theater at the outset of the operation. This deviation from doctrine was required by the JFC in order to mass his forces to thwart a possible invasion of Saudi Arabia by the Iraqi forces already in Kuwait. While this gave priority to combat personnel, it hindered the very arrival and care of these personnel once they did arrive in theater during the buildup.[4]

Perhaps one of the more frustrating problems with ITV and asset tracking was the lack of a common logistical system. This left the U. S. Central Command (USCENTCOM) logistics officer (J4) no appropriate means to exercise proper oversight over logistics for the JFC. Each service had its own system for tracking fuel, repair parts, ordnance, personnel and the transportation and delivery of each. These systems were not tied together by any common interface which would even allow for tracking of common user items among the services. This coupled with the lack of ITV, made it difficult for the end user, the guy in the foxhole, to have much confidence that what he ordered was in truth being sent to him, and consequently many items were reordered "just in case."[5]

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[4] U.S. Department of Defense, Conduct of the Persian Gulf War, (Washington, D.C.: April 1992), F-4.
[5] James K. Matthews and Cora J. Holt, So Many, So Much, So Far, So Fast: United States Transportation Command and Strategic Deployment for Operation Desert Shield/Desert Storm, (Washington, D.C.: U. S. Government Printing Office, 1996), 27.

There was also no consistent means of interfacing commercial vendor delivered items into a common tracking system. Items delivered directly from vendor to embarkation ports were often not marked with enough information to determine what it was, where it should be sent and to whom it belonged. These items typically were labeled as "frustrated cargo," or items for which there was no known addressee or destination; the military equivalent of "dead mail." In fact, a significant number of items were simply addressed to "Operation Desert Shield."[6] Until it can be identified properly, cargo of this type regardless of priority, may not move into the theater for a substantial period of time, as other identifiable high priority items will be sent first.

Many of the solutions proposed to improve operational logistics based on the lessons learned during Desert Storm were the result of the introduction of better computerized data management systems and networked information systems. Many of the problems with cargo identification, manifests and ITV could be reduced with the application of off-the-shelf technology and software. These improvements in ITV would present several great benefits to operations.

First, if material could be tracked reliably from origin to destination, realistic forecasts could be made regarding future lift requirements. This additional optimization in scheduling lift would help eliminate friction in the flow of material and personnel in support of operations, and would also allow for greater flexibility.

Second, with greater confidence in the ultimate delivery of equipment, supplies and parts, units in the field would be less likely to reorder items which had not been received. A simple query should be able to produce a near real time location and delivery status. With fewer items being reordered "just in case," more lift is available for other required items or

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[6] Conduct of the Persian Gulf War, F-48.

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additional forces. This greatly improves the efficiency of logistical support efforts. In

addition, there will probably be a substantial savings of fuel otherwise wasted in excess

transportation, which in the area of operations may be a critical factor.

Also, with greater and more reliable ITV, the flow of materials and equipment can be

controlled better by those in charge of the operation. The JFC, through his J4, can maintain

direct oversight of logistics operations, and achieve much better integration of logistics into

the joint planning process from end to end. As the common picture evolves and there are

changes required to delivery times and places, planners can halt or redirect flow as required

by the tempo of operations.[7] This also reduces friction in the plan and allows for more

responsive and flexible operations.

Between the Wars

In the years between the wars, the services attempted to make use of the lessons

learned during Desert Storm to improve the management of logistics, and to improve ITV for

the operational commander. Among the issues identified during Desert Storm was the need

for more command, control and communications bandwidth, as well as continued

development of equipment which could use the global positioning system.[8] Following up on

these two lessons would pay great dividends in logistics support during Operation Iraqi

Freedom, allowing much greater reliability in ITV.

First, the importance of ITV would be elevated by the determination that moving

mountains of material required for thirty days sustainment into theater may create significant

problems beyond placing a tremendous footprint in a host nation. In addition to this possibly

being a point of friction with the host nation, it also produces a great vulnerability in our

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[7] Matthews, and Holt, 27.

logistics system by presenting the enemy with a very valuable target, the destruction of which could seriously hamstring an operation. In order to limit the size of stockpiles in the operational area, much better tracking of material will be required to provide the kind of reliability necessary to ensure a smooth and directed flow to the operational units. In other words, with no big supply dump, material will have to be reliably transported into theater and directly to units. For this to happen, all parties involved have to be able to "see" it throughout its transit, knowing where it is and when it will arrive. Only a robust ITV system will allow this.

There were several initiatives which helped improve ITV in the years since Operation Desert Storm concluded. U. S. Transportation Command (USTRANSCOM) and the Defense Logistics Agency (DLA) studied the distribution and transportation systems of commercial industry to learn what could be applied to military logistics. This resulted in the introduction of computerized tracking systems which were not unlike those used by UPS, Fedex and many major trucking companies.[9] These systems coupled digital identification techniques with GPS and satellite communications to provide precise location data. Queries that used to take hours now can be answered in minutes.[10]

Other improvements came in the form of digital identification systems. During Operation Desert Storm there were early tracking systems for large containers and pallets based on bar coding. The bar code was read with a handheld scanner and transferred to computers for identification and tracking. This was essentially an improved manual system.

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[8] Conduct of the Persian Gulf War, D-23.
[9] David Kiley, "Military Uses Private Sector Supply Tactics," USA Today, 17 April 2003, <http://www.usatoday.com/money/world/iraq/2003-04-17-logistics2_x.htm>, [19 April 2004].
[10] Lt. Gen. Harry D. Raduege, Jr., "Net-Centric Warfare is Changing the Battlefield Environment," CrossTalk, the Journal of Defense Software Engineering, January 2004, <http://www.stsc.hill.af.mil/crosstalk/2004/01/0401Raduege.html>, [19 April 2004].

By the time Operation Iraqi Freedom was in full swing, radio frequency identification (RFID) tags were being used. These devices were small radio transponders which could hold information on the container's contents, originator and destination. These tags not only allow for easier tracking, but also provide the essential information on what is in the container, a much needed piece of the puzzle which was missing during Desert Storm.

The use of RFID tags and tracking systems was not a gradual implementation. Recommendations for improvement following Desert Storm were not fast in coming, mostly because of funding issues. The impetus for real change came in the form of terrorist attacks in September 2001 and the commencement of Operation Enduring Freedom later that year. Now faced with a major operation in Afghanistan, serious emphasis had to be placed on improving logistics, and that required improving ITV.

Operation Iraqi Freedom

By the time Operation Iraqi Freedom was initiated, many improvements to ITV had been instituted and tested during Operation Enduring Freedom. With virtually no working RFID equipment in 2001, USCENTCOM had put together a system which included more than sixty RFID interrogators, over five hundred "trackable" trucks and a reasonably robust joint logistics tracking system with satellite relays by February 2003.[11] This gave the JFC and the J4 much greater visibility and control over operational logistics flow than ever before.

Despite these improvements to ITV, there were still great holes in visibility at the operational level. Visibility from "fort to port" and "port to port," that is, from the point of origin to the point of embarkation and then to the port of debarkation, had improved

dramatically. The problem began in theater after receipt. Containers which had been shipped with items destined for multiple customers had to be broken down into individual deliverables. These often did not have the necessary tracking information for sound ITV.

Additionally, there were training and procedural problems. With new systems rapidly put into place to use information technology to enhance tracking and accountability, there was not enough time to train support personnel to use them effectively. The new RFID tags and computerized tracking and accounting systems were not yet standard, and much training had to be done on the job. New standard operating procedures had yet to be created to provide consistent guidance on how to use the equipment and systems.[12]

The advent of network-centric warfare was beginning to improve management and control all over the battlefield. While there were many new systems which provided common operational level logistics information, each service seemed to have gone its own separate direction in creating systems for ordering and tracking repair items. There was still little in the way of a common interface between these systems, and interfacing had to be manually performed to provide a joint picture of electronically ordered material.[13]

The problem with "frustrated cargo," while greatly improved, was still a major factor of friction in the logistics system. Hundreds of containers and pallets of material and equipment remained backlogged due to insufficient documentation, and there was a discrepancy of more than 1.2 billion dollars between material listed as shipped and material signed as received. Material being shipped out of theater by units redeploying from Iraq was also not properly identified, delaying its classification and shipment. The General

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[11] Dan Caterinicchia, "Military logistics boosts asset visibility," Federal Computer Week, 16 June 2003, < http://www.fcw.com/fcw/articles/2003/0616/tec-log-06-16-03.asp>, [19 April 2004].
[12] General Accounting Office, Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities during Operation Iraqi Freedom, (Washington D.C.: 18 December 2003), 3.

Accounting Office study found stacks of unopened overnight delivered packages and other unidentified material at the Theater Distribution Center in Kuwait.[14]

Lack of a central command element for theater logistics is a rich topic for another paper, but cannot be left unmentioned here. This single factor probably creates more of an ad hoc, frontier atmosphere to operational logistics. While other components which manage forces and tactical level material have commanders responsible to the JFC, the major operational function of logistics is not governed by a doctrinal commander, and the JFC is provided with minimal oversight through his J4 staff. As mentioned in the introduction to this paper, without solid logistics there can be no sustained operation. The lack of a joint logistics commander makes implementation of a common logistics picture more difficult.

There were other initiatives which had been explored to improve logistics. The faddish leadership and management techniques which were experimented with in the 1990s to improve military readiness were also applied to logistics. The concept of "just in time" logistics was supposed to mitigate the problem of shipping thirty or sixty days of sustainment material to be stockpiled in theater. Instead, the responsiveness of logistics systems employing new information technology and data management to improve usage prediction allows material to be "pushed" to keep up with usage instead of being pulled from massive stockpiles. Material is delivered in a constant stream from "factory to foxhole." This logistics management model which focuses on logistics flow rather than large stockpiles found its way into a variety of programs across all services, including the Army's "Velocity Management," the Air Force's "Lean Logistics" and the Navy's efforts in creating "Sea

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[13] Ibid., 3.
[14] Ibid, 2.

Based Logistics."[15] To some extent each provided some foundation to the leaner and more flexible logistics system which delivered the goods during Operation Iraqi Freedom.

Some of the aforementioned difficulties arose to provide one of the more hair-raising moments of Operation Iraqi Freedom. The inability of the logistics system to keep up with what could be called "catastrophic success" led to an operational pause. Front line units had so rapidly advanced in the first few days of the war that fuel, food and ammunition could not be forwarded fast enough to sustain the drive at that brisk and overwhelming pace. This was for two reasons. First, transportation could not keep a large enough stream of material moving forward. Second, communications bandwidth and equipment limitations kept requests for sustainment from the front from getting to the rear after the first couple of days. Luckily, the fellows in the rear who had some access to information on the schemes of unit maneuver made some common sense predictions and kept pushing fuel, food and ammunition without requests.[16] That helped mitigate the difficulties, but the transportation and communications bottlenecks still held things back.

Recommendations

There have been several critiques of logistics operations during Operation Iraqi Freedom which have produced recommendations for improvement. One of the most promising and one which is being advocated by the Office of Force Transformation is Operational Sense and Respond Logistics (OSRL). This theory, while in its early stages, is

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[15] David Schrady, "Combatant Logistics Command and Control for the Joint Force Commander," The Naval War College Review, (Summer 1999), 61.
[16] Science Applications International Corporation, The Sense and Response Logistics Capability and Operation Iraqi Freedom, (McLean, VA: 2003), 17.

based on the belief that future military forces will be operating as dispersed, independent joint forces, and that logistics is a core component of network-centric warfare.[17]

OSRL is believed to be a better mousetrap, leveraging the power of new information networks in the battlespace to create a flexible, adaptable and responsive system to track and manage logistics flow. In theory, this system would link all forces with a common, joint picture of logistics demands, supplies and ITV so that flow could be highly adaptable to real time changes to operations. Operational logistics would no longer be stovepiped in its own cell, but would be truly integrated with operations and intelligence into a common operating picture with seamless capabilities.[18]

This approach to logistics and asset visibility fits in with the current efforts to transform the military. It advocates the use of technology to make our operations leaner, more flexible and unbelievably swift. Perhaps the first nodes of this system will be USTRANSCOM's Global Transportation Network (GTN) and the Deployment and Distribution Operations Center (DDOC) which was established in Iraq for CENTCOM in January 2004.[19] While the GTN provides an information technology tool to track assets, the DDOC provides a single point of contact which the JFC through his J4 can use to exercise oversight of theater logistics.

One of the more frustrating problems in managing operational logistics and ITV is the lack of a common logistics information infrastructure. Each service maintains its own ordering and parts management system. A common supply system within the Department of

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[17] Ibid., 2.

[18] Office of Force Transformation, Operational Sense and Respond Logistics Concept Development, Analysis, and Proof of Concept Capability Integration (draft), Version 2.0, 25 August 2003, 4.

[19] General John W. Handy, USAF, Vice Admiral David L. Brewer III, USN and Major General Anne Dunwoody, USA, "Statement," U. S. Congress, Senate, Armed Services Seapower Subcommittee, On the State of the Command, 108th Cong, 2d sess., 10 March 2004, pp15-19.

Defense will go a long way toward improving ITV. One single integrated system which allows ordering and tracking of anything from Class I to Class IX material using a common identification system will be the single most unifying solution to the ITV picture.

Additionally, with one single logistics management system, it makes it easier to conquer the problem of interfacing external inputs. Commercially delivered parts and supplies as well as commercially contracted transportation could much more easily be integrated into a single system than into the several systems among the services. Since contracted services could be required to use a uniform identification scheme, data management could be streamlined, leveraging the power of network-centric systems.

There would eventually be a cost savings in streamlining the logistics management networks into one common system. The life cycle costs of maintaining and improving one system would be much less than the various systems which currently exist, again tying in nicely with the theme of force transformation. The problem is identifying one system which suits the needs of all customers, from strategic planning to tactical end user.

The initial step in this direction may be in creating the Logistics Common Operating Picture (LCOP). This consists of several networks and systems tied together to provide better asset visibility and management, particularly at the operational level. LCOP comprises three main systems: the Joint Deployment and Logistics Model (JDLM), the Integrated Logistics Analysis Program (ILAP) and the In Transit Visibility Network. These provide respectively, graphical displays and data retrieval, a data repository and a movement tracking tool.[20] The key to making this system truly valuable to the JFC and all below him is the integration of data from many external systems into the ILAP, or data storage module of the

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[20] Dan Caterinicchia, "System gives warfighters common logistical view," Federal Computer Week, 16 June 2003, < http://www.fcw.com/fcw/articles/2003/0616/tec-log2-06-16-03.asp>, [19 April 2004].

system. With a common supply system for all services, those data also can be integrated

giving a much neater means of tracking total force assets across all lines.

Another consideration in managing asset visibility is the protection of information. A

more capable enemy with more technological advantages than Iraq or Afghanistan may be

able to exploit the information management part of logistics infrastructure. What would the

potential damage be if an enemy was able to exploit RFID tags and logistics communications

links? He could gain access to operational information on what material is needed, where it

is needed, and could also intercept information on the location of material in transit. Strikes

could then be called in with some precision to destroy vital supplies and equipment. As our

logistics management becomes more network-centric, more care must be given to

safeguarding the data at the operational level.

Making these changes work will take top-down direction. Without higher guidance,

history shows that each service will continue to pursue its own course in logistics

management, even at the operational level. The only thing which is likely to cause all

services to use an integrated information management system for operational logistics will be

direction from above. This seems drastic, but in the absence of more than the guiding

principles of "jointness" and transformation, there will be little in the way of a joint solution

which provides a Joint Force Commander with proper oversight of logistics.

Conclusion

Logistics management and asset visibility have improved tremendously in the last

fifteen years. The lessons learned in Operation Desert Storm were collected and put to use to

give us a much more robust and flexible system. The fruits of these labors were visible in the

responsiveness that logistics displayed in Iraq during Operation Iraqi Freedom.

Now it is important to take the lessons of Operation Iraqi Freedom and put them to work to create a truly joint logistics system which gives the Joint Force Commander real oversight and control over logistics. This will be facilitated greatly by the application of network-centric principles to the improvement of ITV and total asset visibility. A single networked system, consisting of inputs from distributed logistics information systems in all areas of the theater, will provide the real-time information required for the JFC to exercise truly flexible operations which are not held back by the inability of logistics support to keep up.

Bibliography

Caterinicchia, Dan. "System gives warfighters common logistical view." <u>Federal Computer Week</u>. 16 June 2003. < http://www.fcw.com/fcw/articles/2003/0616/tec-log2-06-16-03.asp>. [19 April 2004].

_____. "Military Logistics Boosts Asset Visibility." <u>Federal Computer Week</u>. 16 June 2003. < http://www.fcw.com/fcw/articles/2003/0616/tec-log-06-16-03.asp>. [19 April 2004].

Cohen, Eliot A., et al. <u>Gulf War Air Power Survey, Vol. III, Logistics and Support</u>. Washington, DC: U.S. Air Force Dept. and Gov't. Printing Off., 1993.

Kiley, David. "Military Uses Private Sector Supply Tactics." <u>USA Today</u>. 17 April 2003. <http://www.usatoday.com/money/world/iraq/2003-04-17-logistics2_x.htm>. [19 April 2004].

Matthews, James K. and Holt, Cora J. <u>So Many, So Much, So Far, So Fast: United States Transportation Command and Strategic Deployment for Operation Desert Shield/Storm</u>. Washington, DC: U.S. Government Printing Office, 1996.

Pagonis, William G. <u>Moving Mountains: Lessons in Leadership and Logistics from the Gulf War</u>. Boston, MA: Harvard Business School Press, 1992.

Raduege, Jr., Lt. Gen. Harry D. "Net-Centric Warfare is Changing the Battlefield Environment." <u>CrossTalk, the Journal of Defense Software Engineering</u>. January 2004. <http://www.stsc.hill.af.mil/crosstalk/2004/01/0401Raduege.html>. [19 April 2004].

Schrady, David. "Combatant Logistics Command and Control for the Joint Force Commander." <u>The Naval War College Review</u>. (Summer 1999).

Science Applications International Corporation. <u>The Sense and Response Logistics Capability and Operation Iraqi Freedom</u>. Mclean, VA: 2003.

U.S. Congress. Senate. Armed Services Seapower Subcommittee. <u>On The State of the Command</u>: Hearings before the Armed Services Seapower Subcommittee. 108th Cong, 2d sess., 10 March 2004.

U.S. Department of Defense. <u>Conduct of the Persian Gulf War</u>. Washington, DC: 1992.

U.S. General Accounting Office. <u>Defense Logistics: Preliminary Observations on the Effectiveness of Logistics Activities during Operation Iraqi Freedom</u>. Washington, DC: 2003.

U.S. Joint Chiefs of Staff. <u>Doctrine for Logistics Support of Joint Operations</u>. Joint Pub 4-0.
Washington, DC: 2000.

U.S. Office of Force Transformation. <u>Operational Sense and respond Logistics Concept
Development, Analysis, and Proof of Concept Capability Integration (draft) V2.0</u>.
2003.