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Contingency Operation Logistics: USTRANSCOM's Role When Less Must Be More

A Monograph
by

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Transportation Corps



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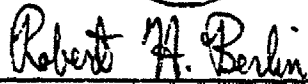
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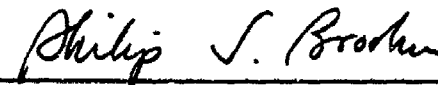
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ABSTRACT

CONTINGENCY OPERATION LOGISTICS: USTRANSCOM's ROLE WHEN LESS MUST BE MORE by MAJ Brian R. Layer, USA, 49 Pages.

This monograph discusses logistics in contingency operations. Specifically it explores an expanded role for USTRANSCOM in CONUS-based force deployment operations. The paper looks at logistics as an important and often overlooked tool for conducting the operational art in this environment.

In recent years, many civilian enterprises have leveraged modern computer and telecommunications technology to create advantages over competitors with effective and efficient logistics systems. Unfortunately, the US military has lagged behind in this area. Rarely is operational logistics considered as a means to create an asymmetrical advantage in campaigns and operations. JCS Pub 1 says that logistics sets a campaign's operational limits. This paper proposes an organizational change to reduce those limits.

The paper begins by introducing a combination of history and theory from both military and civilian sources. From this body of knowledge, the author derives five logistics fundamentals that should undergird an effective and efficient logistics system. These five fundamentals provide a framework for analyzing current operational logistics responsibilities. Several weaknesses in the current division of distribution labor surface when the current statutory and regulatory guidelines are held against the standard of these fundamentals. Next, the rationale for the current USTRANSCOM is examined against the same standard. The monograph then proposes a future role for USTRANSCOM using the five fundamentals as an analytical tool.

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Introduction

Logistics sets the campaign's operational limits.¹

—Joint Pub 1

This monograph searches for a means of reducing the logistical limitations placed upon the operation artist. This calls for more than a minor degree of logistics sophistication. While the idea that logistics is an essential element of operational art has gained acceptance since Chief of Naval Operations, Admiral Ernest H. King said, "I don't know what the hell this logistics is that Marshall is always talking about, but I want some of it,"² it is still an enigma. While the term is firmly entrenched in the US military lexicon, universal awareness should not be confused with universal logistics mastery. Long considered the domain of scientists rather than warriors, the study of logistics has taken a back seat to more "appropriate" areas of study. Discussions of logistics often focus on elementary questions of practical limitations restricting operational options and rarely approach the more sophisticated questions of how logistics can create a decisive advantage over the enemy.

This paper describes ways the Joint Force Commander can reduce operational limits through innovative logistics design. In doing so, the role of the United States Transportation Command (USTRANSCOM) is studied. The monograph asks if that supporting command's distribution responsibilities should

extend beyond a theater's ports of debarkation (PODs)—the current limit of USTRANSCOM responsibility.³ While this limit is the most obvious point to separate strategic and operational logistics efforts, it may not be the most effective or efficient division of labor. The boundary, which gives the "strategic" leg to USTRANSCOM and leaves the operational and tactical distribution role to the theater commander's infrastructure, may reflect tradition and institutional convention more than it reflects logistic reason. This paper looks at the logic of that delineation in contingency operations where the operational force depends upon support from the CONUS base. In these contingencies, the operational logistics effort begins in the US and extends to the "point of action." While the traditional command responsibilities may appear appropriate at first glance, this paper proposes that the common partition of effort is not the most potent logistics design.

Today, the US Armed Forces stand at a precipice. Behind is the solid foundation of history and ahead is the uncertainty of future conflict. This paper builds a blueprint for the future using the proven lessons of the past but amends them as necessary to fit the changing visage of war that looms on the horizon. It includes trends toward smaller wars and regional conflicts with leaner U.S. forces. It weighs the potential of the lengthening lever of new technology against the existing realities of battle. It considers effects of the de-massification of the

battlefield and the capability to conduct lethal, non-linear operations. That any structural change must allow for the deployment of American forces to simultaneous wars in more than one theater is an underpinning of this work. In the end, it measures the logic of current USTRANSCOM responsibilities by holding it against a dual standard of theory and history.

The paper is divided into five major parts. First, it derives five logistics system fundamentals from a combination of military and logistics theory that, when applied, can create operational advantage. Second, the paper compares doctrinal and statutory logistics responsibilities with the fundamentally correct concept. Third, it describes the established role of USTRANSCOM. The fourth section explores a future role for that fledgling command. Finally, the fifth section offers an organizational adjustment that can reduce the logistical limits placed on operational commanders.

Gaining Operational Advantage With Logistics

It has been said that, "Logistics is the final arbiter of operations. . . ." that it, ". . . provides the military artist with the operational substance for use in war."⁴ Before they are applied to the operational canvas, the theory that undergirds logistical design and the fundamentals that comprise that theory must be examined.

The Army's keystone doctrine, FM 100-5, Operations, explains that, "Operational art translates theater strategy and design into operational design which links and interfaces the tactical battles and engagements that, when fought and won, achieve the strategic aim."⁵ The warfighting document further explains that this translation is inconceivable without the operational artist's use of logistics as a principal tool.⁶ The lessons of history undergird this doctrinal assertion. According to military theorist, James Schneider, *continuous logistics* is one of eight necessary conditions for conduct of the operational art. He explains that an army's, "logistics must have advanced to the stage of supporting successive movement and sustainment," in order to enter this advanced stage of warfare. Without this capability, he adds, "formations do not possess sufficient endurance to conduct distributed operations."⁷ While these conditions clearly constitute the prerequisites of the operational art, they were first met over a hundred years ago and alone describe a minimum standard.⁸ The operational artist's logistics challenge is to move beyond this baseline and attack the theoretical ceiling—the elimination of operational limits based on logistics.

Throughout the ages, military commanders have toiled with the supply challenges of their armies; and often their ability to overcome these obstacles has carried the day in battle. Despite this, the subject of military logistics has received relatively little historical attention. A writer whose work offers a notable

exception is historian, Martin Van Creveld. He suggests historians ignore logistics for the following reason:

It may be that this requires, not any great strategic genius but only plain hard work and cold calculation. While absolutely basic, this kind of calculation does not appeal to the imagination, which may be one reason it is so often ignored by military historians.⁹

One of the pioneering military writers who integrated logistics into his studies was Swiss military theorist, Antoine Jomini. He delicately braided supply with tactics to form his influential treatise, The Art of War. That supply comprises a prominent part of his text, "indicates [he] understood [its] important place in the scheme of mobile and expansive warfare."¹⁰ He correctly recognized that the increased mobility of the armies of his age complicated the task of supporting combat operations. Because of this, he warned, the strategist ignorant of logistics would lead his army to peril.¹¹ He explained,

If we retain the term [logistics] we must understand it to be greatly extended and developed in significance so as to embrace not only the duties of ordinary staff officers, but those of generals-in-chief as well.¹²

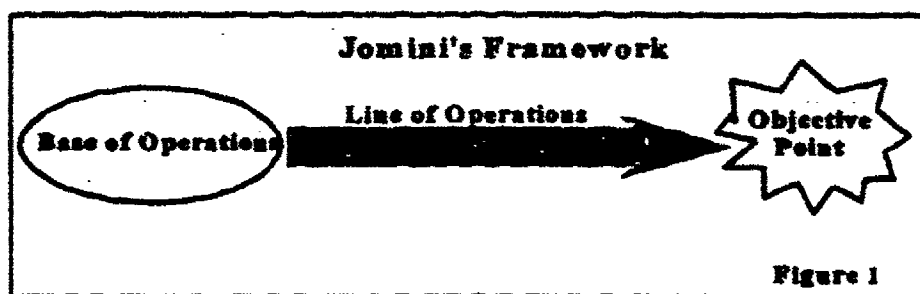
Among his many contributions, Jomini properly identified the paramount problem of supporting the pre-industrial but mobile armies of his day—keeping supplies abreast of rapidly moving troops.¹³ Even today, modern commanders still struggle with the same problem. While the supply concerns of industrial age and incipient information age armies have grown exponentially, the central problem, keeping supplies apace, has remained constant.

Jomini provides a second service by defining the theoretical functions that affect commanders. Here, his discussion helps clarify the logistics object.

"Strategy decides where to act; *logistics brings the troops to this point*; grand tactics decides the manner of execution and the employment of the troops."¹⁴

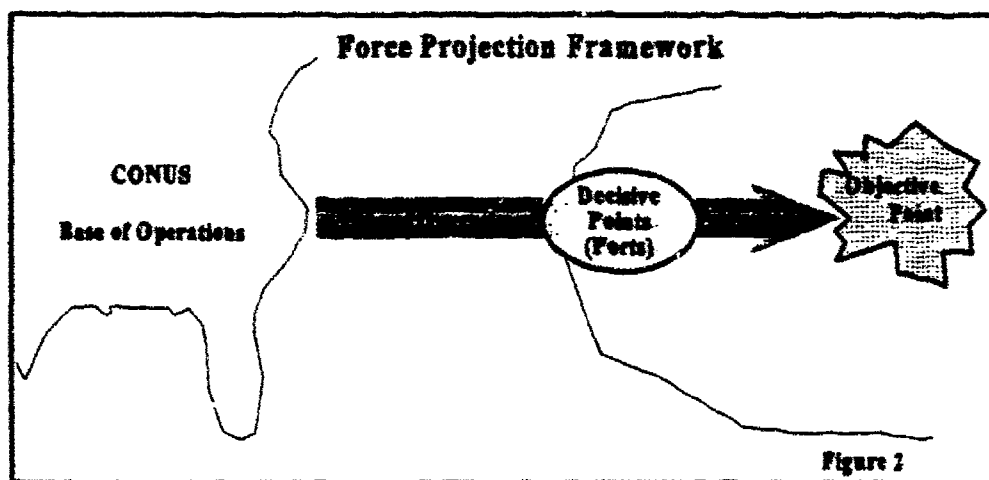
Beyond explaining this general logistics responsibility, he defines a theoretical framework for conducting operations. He begins at the fixed base of operations, where the army obtains its reinforcements and resources, extends along a line of operation, passes through decisive points and ends at an objective point.¹⁵ (See

Figure 1)*



* For purposes of this paper, references to lines of operations and lines of communication are synonymous. Pure Jominian theory also depicts lines of communication running perpendicular to and connecting the army's lines of operation.

It is important to note, that Jomini understood logistics extends along the entire system from a base to the "place to act"—the objective point. Jomini's fundamental architecture fits a force projection army just as tightly. In this case, the force begins at the national base, extends along a line of operations through decisive points (including ports) and ends at an objective point. (see Figure 2)



Historically, the fundamental logistics challenge for an army fighting away from its base has been establishing and defending a base in the theater of operations. An obvious example is the Allied invasion at Normandy in the Second World War. The selection of the most appropriate line of operations and establishing a base to support future operations were the central criteria for selecting the invasion axis which extended from the United States through England across the beaches of Normandy and on to the heart of Germany.¹⁶

The logistics scrapes of a huge allied army attacking across the European continent clearly called for integrating logistics planning into Operation Overlord.¹⁷ Unfortunately, less monumental operations like the U.S. Operation Urgent Fury on the Island of Grenada in 1983 have often received short logistics shrift. For there, despite the complexities of a joint force-projection operation, logistics planning was greatly ignored and logistics experts were excluded from the planning until only hours before the invasion.¹⁸ This omission, justified for reasons of security, added unnecessary confusion to an already complex operation. Unfortunately many similar tales of logistics ignorance pepper the lore of military history.

The challenge of the contemporary operational artist remains the same as Jomini's and from him three important principles of logistics theory are derived. First, the commander must weave logistics into his operational plans. Second, he must build a logistics system that provides uninterrupted support from the primary base to the "place to act." And third, the commander must keep necessary supplies apace of maneuvering forces.

The industrial age ushered in an entirely new type of warfare. Most importantly with it an exponential rise in the level of lethality found on the battlefield.¹⁹ Unfortunately, that lethality came at considerable cost—a corresponding explosion of supply and distribution problems associated with fielding and sustaining the ever more complicated military force. Despite its

corresponding logistical improvements, it is true that sustainment requirements have become an umbilical cord for a modern force tied to and dependent upon continuous supply from its blossoming base.

The new age ushered in an entirely new military logic as well. As the consumption demands of the industrial age army overwhelmed military planners, it gave birth to the logistics science.²⁰ As armies modernized, their thirst for ammunition, spares, and fuel increased exponentially. Consequentially, their reliance on bases containing huge supply stores increased concurrently. From the age of Napoleon to industrialization a moving army was easier to sustain than a stationary force, because food was an army's primary supply concern: foraging was its primary means of acquisition so moving was advantageous. The industrial age reversed this logic. Once an army's equipment and commodity consumption eclipsed its need for food, a stationary army, reliant upon fixed rail and road networks, proved less of a supply challenge.²¹ Industrial age armies' logistics tails ballooned as their dependence upon stock centers in their rear intensified.²² The implosion of the tooth-to-tail ratio has proven the prevalent logic of the industrial age. This makes satisfying Jomini's logistics fundamentals increasingly difficult. Reducing this effect is an important object for modern operational artists.

Although the science of logistics is generally accepted as a military innovation, civilian manufacturers have long incorporated that science into their

daily business operations.²³ A canon of theory supports each discipline. In the past two decades logistic innovations have revolutionized civilian distribution practices.²⁴ Ironically, the US military lagged behind civilian improvement in this same period. Despite the deficit, US operational artists can benefit from these innovative logistics ideas in the future. Logistics is an integral and integrated part of modern business operations and many successful companies provide impressive logistic design models.

Today's leading-edge civilian companies look to logistic design as a tool for gaining competitive advantage over their rivals.²⁵ Like them, military planners should look to their own logistics systems as a means to gain operational advantage over the enemy. The idea that strategic level logistics policies, like weapon system research and development, provide advantage over potential enemies is well accepted; this perception fueled the Cold War arms race. Yet despite conceptual clarity at the strategic level, military planners consider operational logistics a burdensome tie that binds rather than an accelerator that propels a joint force to a position of advantage against a foe.²⁶ In other words, in some campaigns logistics may provide the single military key that opens the door to victory.

Defining what logistics is and what a Joint Force Commander should expect from a logistics system are two essential pieces to solving this logistics

design puzzle. Logistics is perhaps the least understood operational operating system and the mystery is not unique to this age. America's first logistician, Nathanael Green complained, "Nobody ever heard of a quarter master [sic.], in History," upon accepting the job for the Continental Army in 1779.²⁷ Even today, logistics activities remain an enigma. Dr. Roger J. Spiller offers this observation of the recent Gulf War:

As the machinery of the Allied Coalition began to grind, armchair warriors addicted to action, and even some of the hastily recruited "military experts," revealed a certain morbid impatience for the "real war" to begin. But long before the Allied offensive could start, professional logisticians had to gather and transport men and material and provide for the sustained flow of supplies and equipment that throughout history has made possible the conduct of war.²⁸

Uncloaking the functions that transpire in support of the "real war" is an important element of this work. Because of that, it is appropriate to begin with some definition.

Although the science of logistics as an independent military discipline is relatively new, the principal functions of the modern day quartermaster—the logistician—have remained remarkably stable for generations. While the word "logistics" failed to work its place into the common military lexicon of the day, the 1914 *U.S. Army Field Service Regulations* describes it with simple elegance under the auspices of the *service of the interior*. The purpose of the service of the

interior is to, "supply the commander of the field forces with the means necessary for the accomplishment of his mission."²⁹ By 1993 this ballooned definition of logistics appeared in FM 100-5, Operations.

The process of planning and executing the movement and sustainment of forces in the execution of military operations. Logistics includes the design, development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of material; the acquisition, preparation, maintenance, equipping, movement, and health service support of personnel; the acquisition, construction, maintenance, operation, and disposition of facilities. Logistics is an overarching function that must encompass the range of military operations. At the tactical level, logistics focuses on the traditional CSS functions of arming, fixing, fueling, manning, moving, and sustaining soldiers.³⁰

The expanded definition reflects both the growing complexity of supporting combat operations and an institutionally antiquated understanding of the logistic function. The fifty year old comments of two Army historians still apply; after a twelve page attempt to define the logistic function, they reported:

Evidently the term is still in process of rapid and healthy growth. Until it matures and settles down, we must accept it, perforce, in whatever guise it appears—that is to say, with the specific shape, content, and emphases it derives from its concrete environment.³¹

Donald Bowersox asserts that integration provides the secret to logistics success. "Integrated logistics consists of a single logic to guide the process of planning, allocating and controlling resources committed to physical distribution."³² Where, FM 100-5 still depicts logistics as a maze with a myriad of independent tasks, a simple definition that emphasizes the link between military

outcomes and logistics may prove more useful. Many leading civilian logistics experts like Dr. Bowersox have turned to integration to optimize the principal process of logistics—physical distribution. Logistics is, after all, an organized effort to distribute things of value, both material and services, to the appropriate place at the appropriate time. Standing alone, material and services are feckless; proper distribution injects life into them by offering time and space utility.³³ So the accumulation of inventory, for instance, is worthless unless the value-added process of correct physical distribution transpires.

Force projection logistics are particularly thorny. Delivering inventory and services resting at a fort or depot in CONUS to the required foxhole, dug in half-way around the world, at the correct time is a daunting challenge. To simplify this effort, distribution activities have been divided into three movement activities. First the movement from posts, camps, stations, depots, and manufacturers to the air and sea ports of embarkation (POEs). The intermediate leg of the journey is traditionally referred to as *strategic* and consists of the inter-theater movement from POEs in CONUS to PODs located in the theater of operations. The final leg of the journey is the movement forward from the PODs to forward bases and foxholes.³⁴ Because integrating logistics across this entire spectrum from fort to foxhole is the final step toward reducing limits placed on operational commanders,

erasing unnecessary logistic divisions that separate these three legs is an important starting point.

Currently, two cavernous divides block the road to integrated joint logistics. They are divisions between services and divisions between the three levels of logistics. The former result from statutory obstacles, specifically title 10 of the U.S. Code (see Annex A), and the latter result from the natural tendency to treat the logistics apparatus at each level of war as a unique and isolated system. These two conditions propel each service toward the development of its own logistical stovepipe which is in turn divided into three separate parts. In the end, the JFC depends upon twelve separate logistics systems to fuel his force. While this arrangement has worked in the past, it is far from the most efficient or effective logistical structure.

The most appropriate place to seek models of effectiveness as well as efficiency is civilian enterprise. Because logistics operations comprise significant business costs, managers have discovered streamlined systems lead to larger profits.³⁵ As a result, they have leveraged modern transportation, computer, and communications technology to improve logistics operations.³⁶ While not all civilian practices apply directly to military operations because war has higher stakes and greater uncertainty, many civilian practices merit military emulation.

The first and most important civilian lesson is integration itself. Leading edge companies recognize that logistics integration is pertinent for several reasons. First, a natural interdependence between logistics activities exists where natural synergies can bloom.³⁷ Second, a narrower approach creates the possibility of dysfunctional interfaces. Absent an integrated approach, according to Dr. Bowersox, the enterprise, "creates the potential for classical suboptimization."³⁸ A third reason—perhaps the most important—is that innovative new technologies and systems attack the traditionally anticipatory and inherently wasteful nature of logistics.³⁹ Fourth, complex logistics operations require innovative solutions. As Dr. Bowersox explains: "The challenge for the coming decades is to develop *new ways* of satisfying logistical requirements, not simply using technology to perform *old ways more efficiently*."⁴⁰ And finally, integration insures that logistics efforts support and compliment the overall strategy of the organization.⁴¹ So from Dr. Bowersox two additional theoretical principles emerge. First, a single logic must guide the process of physical distribution throughout the system. Second, all operational plans must include logistics during formulation.

This work would lack credibility, if the relationship between inventory and distribution was ignored. In light of this, a brief discussion of civilian practices is in order. In recent years, businesses elevated inventory reduction to an art form. Just-in-time (JIT) practices provide a useful example because they are, in theory,

the most extreme inventory reduction tool. Underlying the JIT philosophy is an absolute intolerance of waste.⁴² Its objective is getting, "exactly what is needed and conveying it to where it is needed precisely when required."⁴³

Inventory, while integral to almost any enterprise, in excess, discourages a rapid flow of material, increases labor and security investment, and hides inefficiencies in the distribution system.⁴⁴ However, only a fool-hardy commander would accept the risk of not one extra bullet or gallon of fuel. Still, reducing excess inventory is a virtue worth pursuing. Hence, the final logistical fundamental is—eliminate wasteful inventory.

To this point, several useful fundamentals have been derived from a combination of military and civilian theorists. First, commanders must integrate logistics considerations into operational plans. Second, the logistics structure must insure continuous logistics support. Third, logistics support must keep pace with operational forces. Fourth, a single logic guiding the process of physical distribution throughout the system must exist. Finally, commanders must reduce superfluous inventory.

Doctrinal Logistics Structure

Title 10 of the United States Code defines the logistical responsibilities within the Department of Defense (DOD). In doing so, it specifies that the Chairman of the Joint Chiefs of Staff,

prepare joint logistic and mobility plans to support strategic . . . and contingency . . . plans and recommend the assignment of logistic and mobility responsibilities to the Armed Forces in accordance with those logistic and mobility plans.⁴⁵

This specific statutory guidance provides a shove toward logistics integration. The language further enhances the chairman's role and leans closer to integration by directing that the chairman, "review the logistic plans and programs of the CINCs to determine their adequacy and feasibility."⁴⁶ Despite this logical prescription, the language falls short of integration because it also endows the primary responsibility for providing logistics support to the services themselves.⁴⁷ Title 10's specific guidance to the services contradicts its preceding integrative language and directs the development of service-independent logistics systems. Within each service logistics system, a division between strategic, operational, and tactical logistics systems exist as logistics architects attempt to mirror operational command lines. As each level of logistics materializes, it too becomes an independent system which answers the consumption demands of associated combat units and creates

independent consumption demands of its own. Both, in turn, burden the supporting logistics system.

The inherent inefficiency of this statutorily directed system is best described by Admiral Henry Eccles' "snowball effect." As each of the segregated logistics systems tries to meet the inventory demands at the customer end of their stovepipe and runs its own independent accounting process, inventories swell and adjunct labor requirements soar. These inefficiencies lead to huge bases, limit operational options, and immobilize joint forces. The "snowball effect" explains why logistics activities naturally tend to grow out of proportion to the forces which they support.⁴⁸ A preeminent "joint" logistician, Admiral Henry Eccles, explained the "snowball effect" this way.⁴⁹

Experience shows that logistic activities tend to grow to inordinate size like a snowball, that they tend to become rigid, and that they tend to acquire a very real physical momentum. Therefore, if we are to control and to adjust logistical activities in such a way as to attain the greatest sustained combat effectiveness, we must reduce the "snowball," create flexibility, and control and exploit momentum.⁵⁰

This phenomenon, described over three decades ago, still impedes the effective use of military forces where the "snowball effect" is potentially magnified by the horizontal and vertical segregation in modern American logistic design.

A problem with these fragmented systems is decentralized accounting. Because the logistic system contains three independent components—segregated

along strategic, operational, and tactical lines—each accounts for its own inventory and demands its own distribution assets. As a consequence, each component requires enough infrastructure to account, store, and transport the inventory flow of the entire pipeline. "When evaluated from a systems viewpoint, integrated logistics identifies a need for compromise between and among traditional practices."⁵¹ Where one independent logistics level searches for effective and efficient logistical practices, the impact of their correct internal decisions often affects the entire system negatively.⁵² It is important to see how the designed logistical structure influences the entire system's behavior over time.⁵³

U.S. joint doctrine integrates logistics into the campaign planning process. It serves as one of six operational functions "that provide the JFC with an efficient structure to complete the campaign design."⁵⁴ At the operational level of war, sustainment is the pipeline that links the fuel of national economic might to the engine of tactical support. It preserves the campaign's tempo and continuity by avoiding culminating points through planning, anticipating, and sustaining the plan as a whole.⁵⁵

Joint Pub 4.0, Doctrine for Logistic Support of Joint Operation, does not outline a specific doctrinal logistics structure. While this does allow the JFC sufficient latitude to design a system that supports his designated scheme (without overburdening it), it provides insufficient doctrinal impetus for developing

consistent structures no matter the contingency. In other words, each JFC must build his logistic infrastructure almost from scratch, forcing supporting units that support multiple contingencies to form ad hoc relationships for each new event.⁵⁶ Despite the lack of specific design requirements, Joint Pub 4.0 does proscribe some general guidelines about the lines between strategic and operational level logistics.

Combattant commanders' strategic logistic concept will focus on the ability to generate and move forces and material into the theater base and on to desired operating locations, where operational logistic concepts are employed. With the transportation and distribution systems in mind planners must determine the basic . . . requirements of the combattant commanders' concept of operations.⁵⁷

This passage directs the JFC to divide his operational transportation and distribution systems at the theater base.

The force of the future, unlike its antecedent cold war behemoth, will deploy and fight from the CONUS and its principal base will exist there as well. Consequently, future plans must include logistic systems that reflect that changed reality. In Operation Desert Storm, the Iraqis kindly allowed Coalition Forces the luxury of developing a theater base. During those six months, the Coalition paved a relatively smooth road to victory. While it is hard to quarrel with Desert Storm results, basing plans on the assumption that future enemies will display similar hospitality invites danger.

Much of this fixation on the theater base is a hold-over from the European focus of old, where U.S. logistics forces owned and operated a fixed theater base located on the European Continent.⁵⁸ There, a clear line of demarcation divided strategic and operational logistics systems. At the theater level, echelons above corps (EAC) logistics units operated the PODs as well as all links into the tactical units; in other words, the strategic leg ended at the edge of the European Continent. While the division of labor proved adequate for Europe, it hardly justifies developing a doctrinal bias toward that arrangement. In Europe, the linear geometry of the projected continental battle joined the existing theater logistics foundation to form a genuine rear area for logistics operations. This rear area was and still is controlled by a Theater Army Area Command (21st TAACOM).⁵⁹ Rear area activities played such a significant role in the Army's vision of the future fight that the Army developed a doctrinal blueprint for rear area operations—FM 90-14, Rear Battle, to delineate fighting responsibilities there. Despite these efforts, the war in Europe never emerged.

The Gulf War turned forty years of experience on its head by repudiating the principle that EAC logistics is fundamentally a rear area operation. There, a system of forward positioned logistical bases comprised the foundation of the EAC logistics system.⁶⁰ During that conflict many EAC logistics tasks transpired far forward of the traditional rear area clouding the traditional boundaries that divide the strategic, operational and tactical logistic effort. Despite this fusing of areas of responsibility, the chores of strategic distribution again ended at the PODs. This

reflected an institutional bias in the military logistics community and violated an important fundamental of logistic theory—a single logic guiding the process of physical distribution throughout the system.⁶¹

Subsequent doctrinal guidance reflects some of the ambiguity arising from Operation Desert Storm. The first post-Cold War and post Gulf War edition of FM 100-5, Operations, stakes its claim on the nature of future war by stating, "Army forces today are likely to encounter conditions of greater ambiguity and uncertainty."⁶² The manual includes the warning that in some operations the rear area may never form.⁶³ This being said, the logistics system must provide continuous and dependable support that avoids operational failure. To do so, the logistics system must strike a delicate balance between too much and not enough and, "sustain operations throughout the peaks and valleys of their duration without burdening commanders with more support than is necessary to succeed."⁶⁴

The JFC's ability to develop effective and efficient logistics systems in this cloudy environment take on a greater degree of difficulty. Still, the fundamentals introduced earlier remain the same. In the final analysis, the system must insure continuous support with the ability to surge for accelerated operations without causing logistical culmination. The newly formed USTRANSCOM may provide the means to accomplish all three in the uncertain environment of the future.

A Unified Transportation Command

President Ronald Reagan directed establishment of a Unified Transportation Command by signing National Security Decision Directive No. 219 on 1 April 1986.⁶⁵ When the command was formed, the American strategic context was dramatically different from today. Not surprisingly, USTRANSCOM's existing charter reflects that eclipsed world situation. Then, America's sons and daughters still resolutely stared across the Inter-German Border at a known enemy. Behind them stood a labyrinth of logistic systems designed to fuel their defense against Soviet expansion. One year later, on the first of July 1987 the United States Transportation Command was activated at Scott Air Force Base, Illinois. General Duane H. Cassidy, Commander in Chief (CINC) of the Specified Military Airlift Command (MAC), assumed command of the new unified command that day.⁶⁶ Two additional service-component transportation commands, the Navy's Military Sealift Command (MSC) and the Army's Military Traffic Management Command (MTMC) joined MAC in forming the nucleus of the United States Transportation Command.⁶⁷ The newly formed organization assumed responsibility for bridging the gap separating units in the United States from their reinforcing mission in Europe.⁶⁸ Once across the Atlantic, the units would fall into an existing logistics web which supplied and supported the

European Theater. While that war never came, the derived logistic logic influenced the long-term responsibilities of USTRANSCOM.

The original USTRANSCOM charter included the mission of providing "global air, sea, and land transportation to meet national security needs."⁶⁹ Soon their responsibilities were extended to include, "common-user airlift, sealift, terminal services, and US commercial air and land transportation to deploy, employ, and sustain US forces on a global basis."⁷⁰

USTRANSCOM first demonstrated the benefits of its broad charter in Operation Just Cause. There, the command performed a critical role in all deployment planning and execution.⁷¹ This was a stark contrast to the US forced-entry operation on the Island of Grenada in 1983. Later in Operation Desert Storm, USTRANSCOM planned and executed the largest strategic deployment since World War II.⁷² This Herculean task has been compared with moving the entire population of Alaska and all their possessions half way around the globe.⁷³ The chore included the requisition of both civilian and military lift assets from around the world. They joined American military and civil fleets to form a legion of lift assets capable of moving the force that defeated the Iraqi Army.⁷⁴ The new unified command's task included the management, operation, and maintenance of that fleet.

Yet in both Desert Storm and Just Cause the USTRANSCOM role barely strayed from the traditional function expected in a European Contingency and fell far short of their logistics potential. They delivered forces and commodities to the PODS and no further.⁷⁵ This did not happen by chance; USTRANSCOM's directed responsibilities include working with regional CINCs "to insure proper interface of strategic and theater transportation systems."⁷⁶ They do not include, however, managing or operating transportation beyond this point. This guidance creates an awkward seam at the POD between strategic and operational distribution systems. Operation Desert Storm provides a good example of this arrangement's cumbersome nature.

When the definitive studies of Operation Desert Storm are completed, its logistics legacy may well be defined by wastefulness. Despite the best intentions of everyone involved, uncertainty proved a perpetual ghost in the logistics machine. The resultant pursuit of certainty led to a glut of inventory. While numerous examples exist, the following illustrate this problem. First, ammunition wastefulness was critical. Had the war started early or had a second contingency surfaced elsewhere, the nation was poorly postured for response. The glut caused by antiquated planning factors and poor in-transit visibility, did not reflect the explosion of lethality and accuracy indicative of new weapon technology. A good example is 155 mm ammunition. While over 3 million rounds arrived in the theater

of operations, US forces fired only a fraction and nearly 3 million rounds returned to CONUS unused.⁷⁷ An additional example is tank ammunition. The US logistics planners based their consumption estimates on previous experience—the great tank battles of the Second World War.⁷⁸ The old data proved excessive as tank crew ammunition consumption fell far short of accepted planning factors. The increased tank accuracy and lethality when coupled with soldier discipline proved staggering. Initial studies indicate "that the Abrams main gun required less than 1.2 rounds for each enemy tank destroyed, contrasted with World War II tank engagements where each main gun averaged 17 rounds per kill."⁷⁹

After the war, logistical hero and 22d Support Command Commander, LTG William "Gus" Pagonis claimed, "there was nothing that surprised us and nothing that we weren't prepared for."⁸⁰ Still, many inventory accountability problems arose because commanders could not get essential information on their supply status. Even when adequate inventory existed, deployed logisticians were often unaware. CASCOM commander, LTG Sam Wakefield, explains.

We took great pride in our Gulf deployment. We moved the equivalent of the city of Richmond over there in a few months—over 40 thousand containers. But guess what? We had to open 25,000 of them to see what was inside. . . . We simply cannot afford to do that again.⁸¹

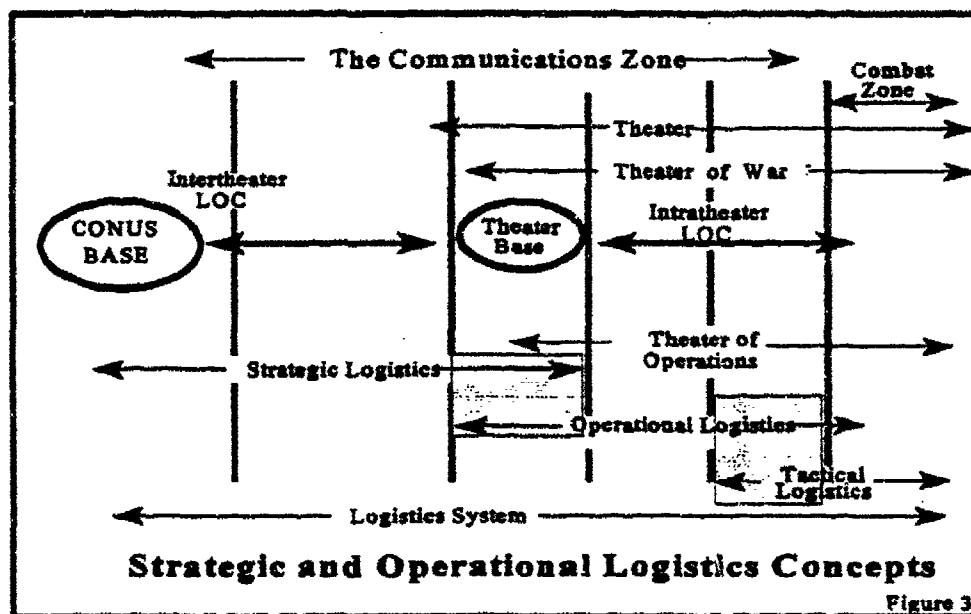
Pagonis adds,

We hauled a lot of containers 2,000 miles out into the desert only to find that 10 percent of their contents were intended for the front

line troops, whereas 90 percent belonged to units back near the port.¹²

This lack of "intransit-visibility" aggravated by the awkward logistic design caused a further accumulation of inventory because commander's diminishing faith in the logistics system led them to reorder inventory already in the pipeline. Operation Desert Storm fulfilled Admiral Eccles's snowball prophecy. Because "strategic" logisticians saw everything beyond the ports as part of the same whole, a delivery to the port answered their clarion call. Consequently, filling a single container with goods for multiple consignees made good sense to the "strategic" logistician. Yet, the same act defied the logic of the "operational" logistician. The two would have seen the same effects and avoided them if they integrated their efforts to form one logistics system.

In force-projection operations, both "too much" and "not enough" are vices. While the problems associated with famine are obvious, the three principal flaws of feast are less clear. First, excess inventory competes for limited transport assets and lengthens the time of force deployment. Second, excess inventories require additional units and material handling equipment which again retard force closure by demanding the same strategic transport systems as combat forces. And finally, these huge inventories and associated needs form large bases, require combat forces for their protection, and limit the JFC's options to stray from the stores that fuel his force.



While Joint and Service doctrine allows for limited integration, it falls short of directing a seamless system. Doctrinal architecture is depicted in Figure 3.¹³ It depicts distinct flowing strategic and operational zones of responsibility and allows for an area of overlap. These grey areas correctly identify that logistics efforts are integrated at all levels. To completely integrate the system a single logic should control the entire logistic system. And, a single command should operate the integrated system that reaches from the CONUS base to the "place to act."

The unified transportation command concept falls far short of its grand promise. While it integrates transportation assets from fort to POE and from POE to POD, it offers little overall operational assistance. Because its assets and systems play a dominant role in the operational distribution system, the command

must play a more commanding role in theater design and forward distribution activities.

A Future Role for USTRANSCOM

Modern technology has bridged many of the obstacles that previously forced the transition from one distribution system to another. The advent of intermodal transportation technologies coupled with modern communications capabilities have transformed the transportation industry. As an example, a typical Midwestern civilian business that sold products overseas in the 1960s would from necessity procure transportation services from a minimum of four carriers. These included truck to a rail head, rail to a seaport, ship to a foreign sea port, and, at a minimum, a different truck to the market. Today that business can accomplish the same shipment by coordinating with a lone carrier providing international intermodal service. Once civilian industry, like the military, considered transport by road and rail on land, ship at sea, and plane in the air distinct and discrete businesses. Today however, using containers, Roll-on Roll-off ships, and trailer-on-flat-cars a single carrier can handle all modes of transport.⁴⁴

These same technologies affect military distribution systems. The prevalence of containerization demonstrates the influence of intermodal technology

on military distribution. Beyond the physical barriers falling, communications make the world a much smaller place. The real-time flow of critical logistic information has revolutionized military support operations. Supporting forces deployed across the globe is difficult particularly before traditional logistics communication systems arrive.

During Operation Desert Storm, resourceful American logisticians, using the latest technology, knocked on the door of the future with the newest technology. The Army's definitive report on the conflict, Certain Victory: The US Army in the Gulf War, states:

Adaptability, innovation, and ingenuity worked to fill holes in the logistics system. . . . But with depots nearly half a world away, just a few days' delay imposed by an occasional requirement to carry supply transactions over long distances by hand caused very serious interruptions in service.⁸⁵

While many of their efforts were ad hoc, the successful innovations did not go unnoticed. The Army has institutionalized important logistics lessons as a result of the Gulf War.

A constant theme running through all these changes is the desire to pare away the joint force tail without diminishing its tooth—no easy chore. "This new concept demand[s] a constriction of logistics bureaucracies in favor of functional building blocks and management oversight to get the job done—and no more."⁸⁶

In the Gulf War, many commanders jumped difficult logistic hurdles with the aid of

cellular phones and satellite communications.⁸⁷ This simple process proved very effective. The 22d Support Command, for example, relied upon a single-channel tactical linkage to their home in Fort McPherson, Georgia to work critical actions.⁸⁸ These efforts inspired the first innovation. It is split-based logistics which relies on modern tele-communications, leveraging large capacity data transmission and satellite technology to reduce the requirement for logisticians in the field. Logistics units can conduct entire functions, like material management, with the majority of the assigned soldiers remaining at their CONUS base. Requisitions get passed from the deployed cell back to the unit in CONUS where it is rapidly forwarded to the appropriate agency.⁸⁹

A second innovation is pushing necessary inventory forward to reduce the tie binding a fighting force to its rear. Physical realities preclude the elimination of some functions. A division's fuel consumption illuminates this point. A modern heavy division consumes fuel at the same rate as a Second World War field army did. Until more efficient engines become commonplace, operational artists' tail trimming efforts must focus on the location of fuel stocks. Innovative commanders are pushing Petroleum, Oil and Lubricant (POL) truck companies forward to division support commands so the required inventory moves along with the fighting force rather than tethering it. As described earlier, Desert Storm

logisticians accomplished many traditional rear area functions well forward of the Corps rear boundary, this innovative practice surfaced there.

The operational artist's freedom of action increases with logistical practices which leverage technology to minimize deployed support units as well as structural design revisions which reduce reliance on a rear area. But the potential for even greater freedom exists. While both of the aforementioned practices improve small portions of the distribution system, the effect pales next to the effect of reorganizing the entire logistic system from fort to foxhole.

Recommendations

Innovative logistics design can reduce the limits placed on operational commanders. Just as in private enterprise, efficient and effective logistics systems can become a source of competitive advantage for the joint force. But this does not happen by chance. The logistics system must conform to a series of aforementioned fundamentals. The best way to reduce the limits placed on commanders is to ensure these fundamentals are met. And the best way to institutionalize these fundamentals is to broaden the role of USTRANSCOM.

USTRANSCOM should own the US operational distribution system. Correspondingly, their responsibilities should expand beyond the PODs to the

"place to act." Hence, one actor, USTRANSCOM owns the entire distribution system from the CONUS base to the tactical level units. The JFC enjoys a powerful and economical source of support for his operations. The five fundamentals offer effective criteria for evaluating the effect of the expanded USTRANSCOM responsibilities. A detailed analysis of each follows.

First, *commanders must integrate logistics considerations into operational plans*. As introduced earlier, joint operational planning doctrine calls for logistics integration. Still, discordant logistic responsibilities subvert this process. While the JFC's logistics staff designs the distribution system beyond the PODs, USTRANSCOM designs the operational inputs that fuel that system. Giving the entire system to USTRANSCOM allows for a seamless system and provides the best hope for economizing the nation's limited distribution assets. Because USTRANSCOM is the owner of the Joint Operation Planning and Execution System (JOPES), they have visibility over all plans. Therefore they can develop an adequate distribution system for a contingency fore-armed with the knowledge of the demands of subsequent exigencies.

The second fundamental is the *logistics structure must insure continuous support*. Again, the JFC will best meet this fundamental with USTRANSCOM's role expanded. Because CONUS will serve as the primary base for most future contingencies, continuous support will require a combination of intra-theater

support and inter-theater support. A single actor who understands the inventory and transportation capabilities of the theater as well as CONUS is desired. In Operation Desert Storm the USTRANSCOM offered a preview of this powerful potential by providing premium theater delivery services by both air and sea.⁹⁰

The third fundamental is *logistics support must keep pace with operational forces*. Continuous support, in itself, is no asset—a supported but inert force provides few options. Therefore, continuous support must sustain the maneuver of the JFC's desired plan. As his ability to do so increasingly relies on CONUS-based support, the case for USTRANSCOM grows.

The fourth fundamental is *a single logic guiding the process of physical distribution throughout the system*. Currently, two operational systems exist. First the inter-theater operational system, USTRANSCOM, bridges the deployed force with the CONUS base and second, the deployed logistic infrastructure connects the force with that bridge. Consequently, two logics contend for control of operational distribution. This is both inefficient and could prove ineffective. The best way to reduce the operational commander's logistical limits is to create one homogenous system following a single logic controlled by USTRANSCOM.

The fifth fundamental is *reduce excess inventory*. This paper has shown how a large base can tether an operational force which is why a paring of the logistics "tail" is underway. As the tail becomes smaller, a greater preponderance

of the logistics actions will occur in CONUS. The existing seam in the middle of the operational distribution system discourages inventory reduction and inhibits flexible operations.

USTRANSCOM provides the appropriate tool for injecting these important logistic fundamentals into joint operations. Without this tool, unnecessary logistic restrictions will restrict the options of operational commanders; with it, the JFC can use logistics to create an advantage over the enemy.

Conclusion

Just as industrial age technology changed the lethality of modern war, information age technology can change the way nations fight as well. An unquenchable thirst for supplies left the industrial age force tethered to its base despite the promise of modern technology. Future joint forces will leverage modern information technology to break free of their base. Because all trends indicate that an increasing preponderance of operational support will originate in CONUS, an efficient, fundamentally sound logistics system becomes a new imperative.

Operational logistics is, "the bridge between our combat troops and the industry and natural resources of our nation."⁹¹ Modern technology continues to make that span shorter and wider. At the same time, the distinction between strategic, operational and tactical logistics are blurring. Because of this, a single actor should control the operational logistics system using a single integrated logic. That actor is the United States Transportation Command.

Joint Pub 1, Joint Warfare of the US Armed Forces, issues the following challenge:

Whether we have years to plan and rehearse, as for the Normandy invasion, months as for Operation DESERT STORM, or only a few days, the US Armed Forces must always be ready to operate in smoothly functioning joint teams.⁹²

Evaluating methods of answering this challenge with logistic design is the intent of this monograph. While which threat waits over the horizon remain a mystery, the certainty that some actor will ultimately challenge the United States with force is not. Until then, it appears that US Armed Forces sit precariously perched on a negatively sloped path. Declining military budgets reflect a growing uneasiness amongst Americans to stand atop the world stage and as American interest in leadership wanes other nation's will undoubtedly rise.⁹³ As the technological and military potential of other powers approaches the United States', her operational artists will turn to new means of achieving asymmetrical advantage.

An often overlooked key to unlocking the mystery of military advantage is logistics and an important element of that key is the USTRANSCOM. The US demonstrated the powerful effect of a joint deployment controlled by a unified transportation command in Operations Just Cause and Desert Storm but most of the potential power of USTRANSCOM still lies dormant. Until the logistics might of the United States is integrated from fort to foxhole, the true effect of a unified transportation command will remain untapped.

ENDNOTES

1. US Armed Forces, Joint Pub 1, Joint Warfare of the US Armed Forces (Washington: Joint Staff, 1991) 46.
2. Admiral King's comments are recounted by, James C. Johnson, and Donald R. Wood, Contemporary Logistics, (New York: Macmillan Publishing Company, 1990), 6.
3. US Armed Forces, Joint Pub 4, Doctrine for Logistic Support of Joint Operations (Washington: Joint Staff, 1992) I-11 - I-12. This document tasks CINCTrans with providing "a complete movement system from origin to *initial* theater destination."
4. James J. Schneider, The Theory of Operational Art, Theoretical Paper No. 3 (Fort Leavenworth, KS: School of Advanced Military Studies, US Army Command and General Staff College, 1 March 1988), 22-23.
5. U.S. Army, FM 100-5, Operations (Washington, DC: Department of the Army, 1993), 6-2.
6. Ibid., 12-2. According to FM 100-5, logistics is a major operating system at each level of war. "Combat operations and logistics increasingly merge at higher levels of war. Neither can be conceived without consideration of the other."
7. James J. Schneider, Vulcan's Anvil: The American Civil War and the Emergence of Operational Art, Theoretical Paper No. 4 (Fort Leavenworth, KS: School of Advanced Military Studies, US Army Command and General Staff College, 16 June 1991), 65.
8. Ibid., 1, 34-35. Dr. Schneider asserts that the operational art began with Grant's campaigns during the American Civil War, with a specific start point of Hooker at Chancellorsville.
9. Martin Van Creveld, Supplying War (Cambridge: Cambridge University Press, 1977), 1-2.
10. J.D. Hittle, introduction to The Art of War by Antoine Henri Jomini in Roots of Strategy: Book 2 (Harrisburg, PA: Stackpole Books, 1987), 416.
11. Jomini, 531. Jomini warns, speaking of operations and administration, "woe to an army where these authorities cease to act in concert!"

12. Jomini, 529.
13. J.D. Hittle, 416. Hittle explains that Jomini recognized that mobile armies would outrun their supplies if commanders did not do the detailed planning required to avoid that result.
14. Jomini, 460.
15. Ibid, 464-465. Jomini clearly builds his theater of operations framework on a European *continental* model. He allows for a series of bases as the army moves from its primary base in the homeland toward the objective point.
16. Dwight D. Eisenhower, Crusade in Europe (New York: Doubleday, 1948), 40-45. General Eisenhower explains the debate about how to attack Germany. He explains the heart of the debate on page 42, "The question before the War Department resolved itself into the selection of the exact line of operations along which the potential power of the United States would be directed against the European Axis. [It] would be designed either to defend vital links in our defensive structure or to support the principal effort when once the main attacking forces should be ready."
17. Ibid, 40-45. The logistical planning for the invasion of Europe spanned over two years and was tightly integrated into the overarching operations plan Overlord.
18. Mark Adkin, Urgent Fury (Lexington, MA: Lexington Books, 1989), 132. Adkin asserts that, "Logistical problems were never considered at all." He explains that the J-4 at both Atlantic Command and the joint staff were deliberately omitted from planning for security reasons.
19. Martin VanCreveld, Supplying War (Cambridge: Cambridge University Press, 1977) VanCreveld describes the connection between the growth of industry in a society and the corresponding growth in the size, complexity and lethality of its army. 109-112.
20. James C. Johnson and Donald R. Wood, Contemporary Logistics (New York: MacMillan Publishing Company, 1990), 6. The authors explain that the science of logistics is a Twentieth Century phenomenon. The first time the word surfaced in the American lexicon was in, Chauncey B. Baker, Transportation of Troops and Material (Kansas City, MO: Hudson Publishing Co., 1905), p.125. [sic.] See also: Felix, J Gerace, "Logistics - Management - Information," (Fort Lee, VA: United States Army Logistics Management Center, May 1965), 1 reprinted by James A. Hutson, The Sinews of War (Washington: United States Army Center of Military History, 1988), 692. He reports, the word's roots extend back to the Greek adjective *logistikos* meaning *skilled in calculating*. Later, in

Roman and Byzantine times a military administrative title *Logista* surfaced referring to a skilled mathematician. Jomini makes the first historical reference to an organized military administrative science.

21. Martin VanCreveld, 233. VanCreveld explains this paradox of modern armies: As their equipment becomes more mobile and lethal, the umbilical cord to the supply base becomes increasingly solid.

22. Kenneth N. Brown, Strategics (Washington: National Defense University Press, 1987), 6-7. Colonel Brown explains why the ratio of supporters to fighters explodes as a result of the industrialization of armies. Armies stepped on this slippery slope when they turned their focus away from killing humans to killing machines. He refers to the two periods as pre-technology and modern.

23. Edward M. Smykay, "Physical Distribution, Military Logistics, and Marketing Management," in Physical Distribution Management ed. Donald J. Bowersox, Bernard J. La Londe, and Edward W. Smykay, (Toronto: Collier-Macmillan, 1969), 51-52. Smykay explains that logistics management was initially designed to answer military requirements but was adopted by civilian businesses as early as the 1940's.

24. Donald J. Bowersox, David J. Closs, and Omar K. Helferich, Logistics Management (New York: Macmillan Publishing Company, 1986), 12-16. The authors explain how civilian businesses revolutionized logistics practices in the last two decades. They describe how business priorities turned toward economical operations using logistical operations for leverage in the 70's. In the subsequent decade, CEOs responded to political and technological change by making logistics the arena where business victory was claimed.

25. Donald J. Bowersox, "Logistics—The Route to Quality," (Plenary paper presented to Eighth National Conference of Logistics, June, 1988), 12. Dr. Bowersox explains that leading-edge (standard setting) companies use logistics competency to gain strategic advantage over competitors. They do it two ways. First, they include logistics design in strategic corporate planning and second, they publish a logistics operation plan that describes standards to customers. It serves as a contract that defines the level of performance the customer can expect. Their willingness to announce their service goals shows the leading-edge company feels it is in control of its processes.

26. Martin VanCreveld, 37. VanCreveld explains that as a limiting factor of strategy, logistics enjoys "pride of place." As a consequence it has enjoyed descriptions like, "the umbilical cord of supply" and "the tyranny of logistics." He counters that neither phrase applies.

27. Library of Congress, Manuscript Division, Washington Papers, Volume 104, F. 82 (Green to Washington, 24 April 1779). Cited in Charles R. Shrader, U.S. Military Logistics, 1607-1991 (New York: Greenwood Press, 1992), 1.
28. Roger J. Spiller, foreword to U.S. Military Logistics, 1607-1991, by Charles R. Shrader (New York: Greenwood Press, 1992), ix.
29. U.S. Army, Field Service Regulations (Washington: War Department, 1914), 112.
30. U. S. Army, FM-100-5, Operations (Washington: Department of the Army, 1993). Glossary 5.
31. Richard M. Leighton and Robert W. Coakley, *Global Logistics and Strategy 1940-1943*. Office of the Chief of Military History, Department of the Army, Washington, D.C., 1955, p. 13. [sic] quoted in Eccles, 45.
32. Bowersox, Closs, and Helferich, 3.
33. Ibid., 4. The authors write that the objective of logistics is to, "arrange delivery of finished inventory . . . to the location where needed, and at the lowest total cost."
34. Fred. E. Elam and Mark Henderson, "The Army's Strategic Mobility Plan," Army Logistician (May - June 1992): 2-4. The authors explain the fort to port, port to port, and port to foxhole challenge of a strategic force.
35. Bowersox, Closs, and Helferich, 4. "Annual logistics expenditures of the United States exceeds 12 per cent of the total gross national product. . . . for every trillion dollar of GNP, the national logistics bill is estimated to be \$120 billion annually, of which transportation represents approximately 70 billion.
36. Ibid., 12. The authors explain in detail how improvements in the area of transportation, microcomputers and, communications have revolutionized logistics practices in the US in recent years.
37. Ibid., 15. The authors claim that the total-system, integrated approach provides a higher order of trade-offs. In integrated systems, the "big picture" is always in view.
38. Ibid.
39. Ibid. The authors call this concept *postponement*; a streamlined logistics system improves confidence and allows the deferment of inventory decisions until actual needs arise.

40. Ibid.
41. Ibid., 14. The authors explain, "The only long-term relevancy is to focus attention on attainment of enterprise strategic goals as contrasted to solving operating problems."
42. Steven A. Melnyk and others, Production Activity Control: A Practical Guide (Homewood IL: Dow Jones—Irwin, 1987) 124. Dr. Melnyk explains that JIT proponents believe waste is only a symptom of bigger problems. Identifying those problems is the underlying objective in these systems.
43. Ibid., 124.
44. Ibid., 129.
45. U.S. Armed Forces, Joint Pub 4-0, Doctrine for Logistic Support of Joint Operations (Washington: Joint Chiefs of Staff, 1992) A-2. Appendix A outlines DOD logistic responsibilities as specified by title 10, USC.
46. Ibid., A-2.
47. Ibid, A-4. "They [the services] will provide logistic support for Service forces, including procurement, distribution, supply, equipment, and maintenance, unless otherwise directed by the Secretary of Defense."
48. Eccles Henry E., Logistics in the National Defense (Westport, CT: Greenwood Press, 1959), 103.
49. Charles R. Shrader calls Eccles book, *Logistics in the National Defense*, the classic introduction to the subject of military logistics in his research guide to military logistics. U.S. Military Logistics, 1607-1991 (New York: Greenwood Press, 1991), 11.
50. Eccles, 103.
51. Bowersox, Logistical Management, 8.
52. Ibid., 8. Dr. Bowersox explains how this trade-off works in business where production, marketing and purchasing departments have traditionally performed as isolated performance areas. While each department made decisions in the best interest of their function, their decisions were often detrimental to the company overall. Many businesses solved this problem by integrating decisions that affected operations beyond the bounds of the fundamental area.

53. Peter M. Senge, The Fifth Discipline (New York: Doubleday Currency, 1990), 44. Senge explains that the term "structure" extends beyond the "logical structure of an organizational chart." He illustrates that "systemic structures" are the key relationships that influence behavior over time.

54. The Joint Chiefs of Staff, Joint Pub 5-00.1, JTTP for Campaign Planning (final draft) (Washington, DC: Office of the Chairman, 1993), II-13.

55. Ibid., II-20 - II-21. Joint Pub 5-00.1 explains, in detail, the operational function of logistics. Anticipatory and continuous support are two over-riding tenets of this operational operating function.

56. Scales, 60-63. Certain Victory provides a detailed description of LTG Pagonis's efforts to "adapt and refine" logistics doctrine to support desert operations. He asserts that future contingency operations will require ad hoc organizations and creative solutions. , 99.

57. Joint Pub 4, III-2

58. Pagonis, 58. LTG Pagonis describes the mission and breadth of the theater logistics forces in Europe during the early 1980's.

59. For a detailed description of theater level support operations, see: US Army, FM 100-16, Support Operations. Echelons Above Corps (Washington: Department of the Army, 1987).

60. William G. Pagonis and James Ireland, "Standardized Logistics," Military Review No. 2 (February, 1994): 14-15. The authors describe the theater logistic architecture in Desert Storm and argue that it is the correct model for the future.

61. Bowersox, Closs, and Helferich, 3-4. The authors explain that modern logistics is defined as: "a single logic to guide the process of planning, allocating and controlling financial and human resources committed to physical distribution, manufacturing support, and purchasing operations." They emphasize that this definition applies across the spectrum of logistics to include military operations.

62. FM 100-5, Operations, 1-1.

63. Ibid., 7-13. "The location of the CSS functions need not be contiguous with their supported combat forces. Sometimes a rear area may not be apparent."

64. Ibid., 12-2.

65. James K. Matthews, The Evolution of the United States Transportation Command: An Annotated Bibliography (Scott AFB, IL: USTRANSCOM

History Office, 1990), vii.

66. Ibid., vii.

67. Ibid.

68. James K. Matthews and Cora J. Holt, General Duane H. Cassidy—United States Transportation Command's First Commander in Chief. An Oral History (Scott AFB, IL: USTRANSCOM History Office, 1990), 8. General Cassidy explains he was even surprised by how much of the command's time was directed toward European Force Closure issues right away. He thought the command would need more time to build credibility before that responsibility was passed to USTRANSCOM.

69. James K. Matthews, The Evolution of the United States Transportation Command: An Annotated Bibliography, 1.

70. Ibid., 1. This responsibility included operational control of the command's three subordinate commands: MTMC, MAC, and MSC. (Original Operational control was limited to times of national emergency.)

71. Thomas Donnelly, Operation Just Cause (New York, Lexington Books, 1991), 79. Donnelly explains that as early as three months prior to the operation, USSOUTHCOM and the JCS turned to the newly formed USTRANSCOM to solve the complicated airlift flow.

72. "Desert Shield / Desert Storm: USTRANSCOM's First Great Challenge," 14. The article explains this deployment surpassed three-month air and sea lift totals from the Korean War Deployment in less than three weeks.

73. Pagonis, 1.

74. "Desert Shield / Desert Storm: USTRANSCOM's First Great Challenge," Defense Transportation Journal 3 (June, 1991): 14-16. This article describes the fleet of ships and aircraft that built the "bridge" to Saudi Arabia.

75. Ibid., 14-16.

76. James K. Matthews and Cora J. Holt, 2.

77. Sam Wakefield, "Directions for the New Era," Defense Transportation Journal, 6 (December, 1992): 19. LTG Wakefield explains that nearly three million 155 mm rounds out of the 3,239,822 sent were returned to the United States. He contends that the United States cannot afford this wastefulness in the future.

78. Robert H. Scales, Certain Victory: The US Army in the Gulf War (Washington: Office of the Chief of Staff, United States Army, 1993), 81. BG Scales explains that Desert Storm planners turned to their last tank-on-tank battle experience, WW II, for planning factors. They proved grossly inaccurate but adequate (in excess) to meet the demands of American forces.
79. Ibid., 81. BG Scales explains that more than 350,000 tons of ammunition were shipped to the Gulf. (Most of it returned unused.)
80. William G. Pagonis with Jeffrey L. Cruikshank, Moving Mountains (Boston: Harvard Business School Press, 1992), 194. LTG Pagonis explains that he was able to preempt surprises with the use of "scull-sessions." He gathered his staff prior to big events and did his "Monday morning quarterbacking on Saturday night."
81. Ibid., 19.
82. Pagonis, 206.
83. Joint Pub 4, I-2. The logistics concepts diagram is located in this publication.
84. Bowersox, 169-170. The author provides a succinct, thorough description of intermodal operations and discusses their relevance.
85. Scales, 71.
86. Ibid., 99.
87. Scales, 69. BG Scales describes the impact of satellite communications in the first days of Desert Shield.
88. Ibid., 70. BG Scales provides a detailed account of the communications support of the 11th Signal Brigade in the Gulf War. He explains that among their many accomplishments, the 22d SUPCOM's direct link to Ft. McPherson was particularly noteworthy.
89. Jerry R. Rutherford and Daniel V. Sulka, "Making FM 100-5 Logistics a Reality," Military Review 2 (February, 1994): 13-14. This article provides a useful description of split-based operations.
90. "Desert Shield / Desert Storm: USTRANSCOM's First Great Challenge," 18. The article provides a detailed account of the Gulf War's premium transportation services. They included a 24-hour air service, *Desert Express* and a 23-day sea container service, *Sealift Express*.

91. "Logistics - Management - Information," (FT Lee, VA: United States Army Logistics Command, 1965) reproduced by James A. Hutson, The Sinews of War (Washington: Center of Military History, United States Army, 1988), 692.

92. Joint Pub 1, iv.

93. Michael Vlahos, "By Our Orthodoxies Shall Ye Know Us," Joint Force Quarterly 2 (Autumn, 1993), 110. Michael Vlahos asserts, "The American people have made it [a decision to quit the world stage] and there is no Stalin around to change their minds."