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LOGISTICS IN THE PRACTICE OF THE OPERATIONAL ART

by

Griffin L. Warren
LCDR, SC, USN

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.

Signature: Griffin L. Warren

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Paper directed by
H. Ward Clark, Jr
Captain, United States Navy
Chairman, Joint Military Operations Department

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Abstract of
LOGISTICS IN THE PRACTICE OF THE OPERATIONAL ART

The emergence of recognition of the operational level of warfare and the increased emphasis on joint operations within the U.S. military during the past decade has improved the country's warfighting capability and national security. The refinement of the operational art and its inclusion in U.S. military doctrine has progressed rapidly. However, despite a long history of operational logistics thought, the corresponding development of operational level logistics in the practice of the operational art has lagged in the U.S. Logistics policy continues to be focused at the strategic and tactical levels to the detriment of the operational level. Moreover, logistics issues tend to be viewed as scientific or quantitative exercises when the operational level demands a more artistic interpretation. Current logistics doctrine contains seven logistics principles as a corollary to the principles of war. The logistics principles span the three levels of warfare and thus do little to focus commanders' and logisticians' thought on the operational level. It is possible, however, to construct a broad conceptual framework of four pillars that can help to focus the thinking of operational logisticians and theater commanders. Examples of theater logistics from the 1991 Gulf War are cited in order to illustrate the conceptual framework.

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CHAPTER 1

INTRODUCTION: THE ART AND SCIENCE OF LOGISTICS

A key to an appreciation of how logistics effects the practice of the operational art is an understanding of the essence of military logistics. Whether logistics is art or science is central to that understanding. The prevailing post World War view has been that logistics functions are rather scientific in nature. Particularly since the end of World War II the role of the logistician has been viewed as something separate or discrete from the realm of the operational warfighter. The application of quantitative operations research methods to logistics functions and the employment of emerging computer technology in logistics fields strengthened the view that the practice of logistics was mainly a scientific endeavor. The traditional view of the origin of the word has been that it was derived from the greek "logistikos", meaning "skilled at calculating", further suggesting that logistics functions could be distilled down into rationally optimized numbers through some mathematical calculus. To this day, the JCS Pub 4-0 (Doctrine for Logistic Support of Joint Operations) defines logistics as;

The science of planning and carrying out the movement and maintenance of forces.....those aspects of military operations which deal with design and development, acquisition, storage, movement distribution, maintenance, evacuation, and disposition of material; movement, evacuation and medical services for personnel; (and) acquisition, construction, maintenance, operation and disposition of facilities....

The importance of scientific tools and principles in the logistician's toolbox should not be understated. However, as we have come to recognize the existence of the operational level of warfare, a different view of logistics has become necessary. A view of logistics (particularly at the operational level) as more art than science and one more integrated into the plans and operations of warfighters has begun to emerge. Within the small but growing body of "operational logisticians" historical revisionists have even changed contentions regarding the origin of the word, "logistics". The word is now assumed to have been derived from the title of the French "major general des logis", an officer whose job it was to lodge or camp the troops and to march them into troop dispositions on the ground before battle. This presumed word origin is more in keeping with the view of logistics as more art than science.

CHAPTER 2

LOGISTICS ACROSS THE SPECTRUM OF WAR

At the tactical level, logistics is used to effect the battle in progress.² Tactical logistics is concerned mainly with the maintenance and sustainment of troops and equipment. The process of providing tactical logistics support centers on the prediction or determination of requirements and matching those requirements to transportation assets to meet the tactical unit at the right time and place. This relatively scientific process has, in many cases, dominated the thought of operational commanders when they consider the area of logistics. Much time and attention has been devoted to the processes involved in providing tactical logistics support with excellent results. Combat Service Support units in the Army and the functional equivalents in her sister services are generally well organized, equipped and staffed to render logistic support at the tactical level.

At the other end of the continuum lies strategic logistics where again, much time, effort and scholarly thought has been invested. Strategic logistics can be thought of to include mobilization, research and development, industrial base and military infrastructure issues. I would also include under the banner of strategic logistics the large community of engineers and logisticians working in the area of acquisition logistics including weapons system design, procurement and Integrated Logistics Support (ILS). The military has long recognized the

importance of strategic logistics as evidenced by the establishment of the Industrial College of the Armed Forces (ICAF) at the National War College. Studies at the ICAF have long concerned themselves with how the economic and industrial power of the nation can be brought to bear on military and national security issues. This view of logistics from the strategic level is understandable considering that the United States' victory in World War II was largely based on our ability to effectively mobilize and to bring our huge industrial capability to bear on the war effort.

Like many abstract concepts, it is much more difficult to define operational logistics than it is to describe it. Some descriptions of the nature of operational logistics follow.

Just as the operational level of war links strategy and tactics, operational logistics links strategic and tactical logistics. At this level it is much harder to make the traditional distinctions between "operations" and "logistics". Such distinctions become irrelevant because traditional views of operations and logistics become inextricably linked. One contemporary logistician has appropriately observed and written that "logistics governs what can, and perhaps more importantly, what cannot be accomplished (by an operational level commander in a theater of war)".³

At the operational level, it is also much harder to apply the scientific principles and models that logisticians have worked so hard to develop to serve their strategic and tactical

logistics needs. The operational logistician must set aside his logistician's toolbox of computer models, simulations and predictions to practice what is, almost entirely, an art form.

Operational level logistics provides the means for the operational level commander to achieve his goals. As such, operational logistics must always be defined in terms of the theater of war and the operational objectives within that theater. Likewise, the operational level of war in a theater; its objectives and sequencing of events become meaningless if considered in a logistics vacuum.

Operational Logistics is an enabling force for the operational level commander and effective operational level logistics support is a force multiplier. The product of operational logistics is sustainment of the military campaign.

It should be clear from the foregoing description of operational logistics that at the operational level, logistics must be completely integrated into campaign planning. One author has correctly noted that a (campaign) plan that cannot be supported logistically is "not a plan at all, but merely an expression of fanciful wishes".⁴

Arguably the most viable of contemporary descriptions of operational logistics has been offered by Lieutenant General William Pagonis and Colonel Michael Krause when they wrote that

operational logistics:

"provides the ability to mass combat power. It is a way of structuring a battle, campaign or strategic setting. It is calculated to create possibilities for future force utilization. Logistics determines how, when and where the force arrives in a theater; where and when combat power can be massed. Logistics underwrites the concept of operations and the scheme of maneuver and is the fulcrum upon which leverage can be created.⁵

CHAPTER 3

OPERATIONAL LOGISTICS: OLD WINE IN NEW BOTTLES?

The notion of an operational level of logistics is not as new as we might assume. Although the term, "operational logistics" had not yet been coined, military theorists throughout history have written about logistics or sustainment issues in distinctly operational contexts.

As early as the 5th century BC, Sun Tzu's writings contained numerous references to logistics issues. Many of his thoughts on logistics appear to have been at the strategic level, (...when an army engages in protracted campaigns, the resources of the state will not suffice").⁶ He expressed his appreciation of logistics in an operational context however, when he wrote in his chapter on maneuver;

"If one moves with everything the stores will travel slowly and he will not gain the advantage. If he leaves the heavy baggage behind and presses on with the light troops, it is to be feared the baggage would be lost."⁷

Further evidence of Sun Tzu's consideration of logistics in a campaign setting appears later in his work:

"When the army has penetrated deep into hostile territory, leaving far behind many enemy cities and towns, it is in serious ground...In serious ground I would ensure a continuous flow of provisions".⁸

From these and other passages it is clear that some of the earliest military commanders understood the essence of the operational art and the fact that operational sustainment -- a

product of operational logistics -- would govern the conduct of the campaign.

By the early nineteenth century western military theory had been further developed and refined. The writings of theorists such as Baron Henri de Jomini and Carl von Clausewitz reflected an emerging recognition of an operational level of warfare linking strategy and tactics. More importantly for our purposes, the appreciation that logistics was part and parcel of the operational campaign was also clear. Jomini devoted extensive treatment to the topic of logistics in his work. Moreover, his writings show a very clear focus on the integration of logistics with strategy and tactics in the conduct of a campaign.

On the surface, Clausewitz appears to draw a clearer distinction between logistics and operations than contemporary operational logisticians would like. At times he appears to subordinate the role of logistics to other military activities. A close reading of his thoughts on "provisioning" (read "sustainment") however, indicates that Clausewitz too acknowledged the effects of logistic support from supply bases through lines of communication on the campaign.

"Food is important for immediate needs, but for an army's general existence over a period of time, the flow of men and equipment is more important...a fact that further explains the influence that a base exerts on operations....(Lines of communication) link the army to his base and serve as its arteries. The roads are in constant use for all sorts of deliveries, for ammunition convoys, detachments moving back and forth, mail carriers and couriers, hospitals and depots, reserve munitions and administrative personnel. All this is vital to the army."

Although he obviously considered matters of logistics secondary he understood the impact that logistics could exert on the operational campaign.

"If war is to be waged in accordance with its essential spirit - with the unbridled violence that lies at its core....- then the feeding of troops, though important, is a secondary matter. On the other hand, where a state of equilibrium has set in...subsistence is likely to become the principle concern. In that case, the Quarter Master General becomes the Supreme Commander..."¹⁰

Further evolution of logistical thought in operational contexts continued throughout the early 20th century but the close of World War II saw the emergence of the first theorists who can truly be called operational logisticians by contemporary standards. In 1941 British General Archibald Wavell wrote that the traits required in a good general begin "with the matter of administration,* which is the real crux of generalship".¹¹ Continuing, he contended that "(u)nfortunately, in most military books strategy and tactics are emphasized at the expense of the administrative factors".¹² He cautions readers "to bear in mind...the importance of this administrative factor, because it is where most critics and many generals go wrong".¹³

On this side of the Atlantic, Rear Admiral Henry E. Eccles emerged as the great logistics thinker of the U.S. Military. Although much of Eccles's research was concerned with strategic

* The British use the term "administration" in lieu of "logistics" Wavell described "administration" to encompass "movement and logistics". Interestingly, the British consider "administration" as one of their principles of warfare.

logistics issues, it is clear that Eccles possessed a distinctly operational outlook in his numerous writings on the subject of logistics. Eccles view of logistics was that of a bridge that spanned the gap between the nation's economy and military tactics. He wrote:

"...logistics is the bridge between the economy of the nation and the tactical operations of the combat forces. Obviously then, the logistics system must be in harmony, both with the economic system (strategic logistics) and the tactical concepts and environment of the combat forces...(Logistics acts to) infuse into the calculations of the strategist an appreciation of what is materially possible."¹⁴

In a review of logistics deficiencies in World war II, Eccles wrote that a primary cause of the failures was an "unwillingness to devote adequate talent and effort to the analysis of the logistical implications of strategy and tactical concepts".¹⁵ Interestingly and perhaps most importantly about Eccles's thoughts is the fact that he coined the term "operational logistics" well before the operational art and operational level logistics would be widely recognized by the U.S. military. As early as 1953 Eccles wrote that , "...'Operational Logistics' is based upon the strategic plans and the broad logistics plans...of the theater and fleet commanders".¹⁶

It is clear from the foregoing that many great military theorists throughout history not only thought "operationally" but regarded logistics in distinctly operational terms with a full appreciation of the total integration of logistics with other military activities at the campaign level. Moreover, the

assertion that logistics can limit what is militarily possible in a theater is a constant theme throughout the writings of these scholars.

It seems strange that operations and logistics would be separated into distinct stovepipes when viewed in the light of a long history of operational logistics thought that would tend to bind the two together. This neglect of operational logistics thought has been manifested in several ways. The persistent perception that logistics is primarily a scientific or quantitative endeavor concerned with satisfying material requirements at the tactical level is evidence of this neglect. This has been true to some degree across all services but perhaps most acute in the Navy. Until fairly recently the unofficial logo for the Chief of Naval Operations' Logistics Directorate (N4) contained the motto "Beans, Bullets and Black Oil" implying that the satisfaction of tactical requirements for these commodities was the principle concern of the organization. Further, the training and organization in our services has tended to strengthen the separation of logistics from operational concerns. In general, operational commanders receive little to no training in logistical areas and logisticians are insufficiently exposed to operational issues. The closest thing to U.S. Navy mlogisticians are "Supply Corps" officers, reinforcing the "beans, bullets and black oil" syndrome.

The neglect of operational logistics thought in the U.S. military can be explained in large measure by the lack of focus

on the operational level of war in general. After all, it would be difficult to conceive of a robust community of operational logisticians during a period when only strategic and tactical levels of warfare were recognized. After World War II, American military theory was focused on strategic issues. Strategic nuclear weapons used as a deterrent against a monolithic communist threat were the centerpiece of military theory. The general feeling was that these weapons rendered conventional operational level theater campaigns such as those waged during World War II obsolete. Accordingly, logistics policy emphasized that strategic level focus. Later, counterinsurgency warfare in South East Asia tended to place the emphasis on tactical level warfare and again logistics theory and policy supported the tactical focus. This bi-polar view of military affairs - strategic and tactical - explains the almost exclusive focus of military logisticians on the strategic and tactical levels.

It was not until the mid-1980s when emerging national security threats in South West Asia spurred a resurgence of operational level thought in the U.S. military. With the publishing of the Army's Field Manual 100-5 (Operations) and the genesis of the AirLand Battle doctrine, the stage was set for a resurgence in operational level thinking throughout the military. The Goldwaters-Nichols act of 1986 was the midwife of the rebirth of operational level thinking. The legislation's emphasis on multi-service organization and joint interoperability fostered the spread of operational level thinking throughout contemporary

service and joint doctrines. But that rebirth is a decade old. The concept of military campaigns in a theater context has enjoyed significant development and refinement during the past decade. The corresponding development of operational logistics has lagged however. The recognition of the total integration between logistics and other military activities at the operational level has been slow.

The Gulf war of Kuwaiti liberation has been widely touted as a successful application of the operational art by the U.S. led coalition. Moreover, the successful application of operational logistics in support of the campaign plan has been claimed by many contemporary logisticians. Despite the obviously favorable outcome and the superb logistical support in the desert, there is some evidence to suggest that the campaign plan and logistics were not completely integrated, at least in the initial stages. A close reading of an account of gulf war logistics by the chief logistician, LTGEN Gus Pagonis, leads one to believe that he was not involved in the initial planning for the offensive. An interesting passage in his book suggests that he unilaterally planned support for the offensive during Operation Desert Shield and that he has not been briefed into offensive planning by the CINC.¹⁷ Commanders with a full appreciation of the importance of integrating logistics into campaign planning might have been expected to include his logistician earlier in process (particularly for a desert campaign so dependent on logistics for sustainment).

There is some cause to be optimistic and some indication that improvements have been made in the area of integrating logistics into campaign planning. Perhaps due in part to the Gulf War, Operational Logistics thinking has begun to enjoy a resurgence. The publishing of Joint Pub 4-0 Doctrine for Logistics Support of Joint Operations in 1992 has done much to stress the importance of logistics to operational commanders. The inclusion of logistics doctrine development in the taskings to the nascent Naval Doctrine Center represents a promising development. The recent emphasis on logistics issues in several war games including a recently completed Logistics War Game at the Naval War College may reinforce optimism. Much work remains to be done in the area of cross training operators to think logistically and logisticians to think operationally but the trend toward doing so in joint military education provides promise.

CHAPTER 4

PRINCIPLES OF OPERATIONAL LOGISTICS

How then, should commanders regard logistics in an operational context? How should logisticians think operationally? What constructs or models apply to contemporary operational logistics?

Over the years, a set of principles of war have been developed and refined. The nine principles with the mnemonic acronym "MOOSEMUSS" along with some other generally accepted concepts (e.g. centers of gravity, culminating point) are intended to provide a conceptual framework for the assessment or analysis of operational alternatives. As a corollary to the principles of war several principles of logistics have also been developed and are contained in Joint Pub 4-0. The principles: responsiveness; simplicity; flexibility; economy; attainability; sustainability and survivability apply, in theory, to all levels of logistics across the spectrum of warfare -- strategic, operational and tactical.¹⁸ Other authors, most notable James A. Huston, (formerly on the Naval War College faculty) have developed similar lists of logistics principles. They are, out of necessity, broad constructs and considerations that can be self contradictory when applied. For example, a logistics systems which is economical may not be sufficiently responsive. A system which embodies simplicity may lack the redundancy necessary to be survivable in the event of enemy combat actions taken against logistics nodes.

The principles of logistics are useful in general terms. Certainly, none can be argued to be patently incorrect but their general nature limit their utility for application in a strictly operational context. Taken as a whole, they do little to help the warfighting CINC to exercise his directive authority over logistics or to aid the logistician in appreciating operational issues.

It is possible, however, to develop a conceptual framework for how logistics principles can be applied at the operational level of war. These four pillars of operational logistics can be used to frame logistics principles in operational terms and can be used by both warfighting CINCs and operational logisticians to focus on operational logistics issues.

The first of the pillars must be RELATIONSHIP. That is to say the relationship between logistics and other military activities at the operational level. At the root of the relationship between logistics and other campaign activities is the fact that logistics can and will govern what is militarily achievable. Logistics and other activities should be thought of as being roughly equivalent.¹⁹ The notion of RELATIONSHIP helps us to remember that operations and logistics are inextricably linked and that the principles of warfare must not be thought of in a logistics vacuum.

Also part of the RELATIONSHIP pillar is the notion of "balance". Balance is the essence of most debates over "tooth-to-tail" ratios, that is the ratio of combat to support personnel

in theater. It is easy to take the idea of equivalence too far and to allow the relationship to become unbalanced. Huston does just that when he argues that "no distinction in importance can be made between combat functions and logistics functions" and that "no distinction should be drawn...in establishing priorities (between them)"²⁰. Huston goes on to allege that the mobilization of logistics support troops must precede the mobilization of combat troops and to do otherwise puts "the cart before the horse".²¹ Certainly, attaining the minimum essential supplies and services to begin combat operations in a theater is important but Huston's view, if followed dogmatically, is seriously unbalanced toward logistics and ignores other operational considerations. Operational commanders must have a feel for when combat operations will become limited or governed by logistics and they must constantly make balanced risk assessments and tradeoffs between logistics and combat functions. Operational logisticians must be capable of providing dispassionate and objective advice to the CINC regarding support and not dogmatically insist upon being the first off the boat.

During the build-up for Gulf War there was much debate regarding the initial "tooth-to-tail" ratio and the prevailing view of logisticians was that minimum essential logistics support was not in theater to support combat operations. The CINC was aware of the inherent risk arising from the limitations that logistics would exert on combat operations. Given the threat of Iraqi incursions into Saudi Arabia, however, the appropriate

decision was made to accept some risk and deploy "killers" with limited logistics means. Surely, the deployment of Combat Service Support personnel with limited self defense capability would have provided inadequate combat capability and done little to deter Iraqi incursion.

Balance is most often thought of in the initial build-up for combat but it is an important element throughout the campaign as well. Logistics personnel, units and equipment require logistics support. The more logistics support that is brought into theater, the more support is required to sustain it. The resulting inflationary spiral of logistics needs has been called the "logistics snowball" by Eccles to demonstrate the tendency for logistics needs to grow in a theater.²² This is an important construct for operational logisticians to remember. An inordinately sized "tail" can seriously reduce flexibility and rob combat forces of critically needed strategic and theater lift.

The second of our operational logistics pillars is RESOURCES. The resource pillar embodies issues surrounding material placement and material movement throughout the theater. Among the logistics principles that are contained within the RESOURCE pillar at the operational level are Flexibility, Simplicity and Survivability. Among the most important constructs in the RESOURCE pillar, however, is one not included in the Joint Pub 4-0 list of logistics principles. The element of "continuity" was discussed by Huston but in largely strategic

terms.²³ His notion was that logistics systems must operate in peace time as they are intended to operate in war and that they should transition from peace to war seamlessly. While this is unarguably true, it has little applicability at the operational level.

Resource continuity should be thought of in terms of the capability to provide sustained, uninterrupted support to forward deployed forces. A logistics system capable of providing only periodic support due to insufficient resources, inadequate transportation or other limitations is not likely to provide the responsiveness required to support high tempo combat operations. To ensure resource continuity is achieved some degree of logistics momentum should be realized and sustained. Bottlenecks or poor distribution of supplies through the theater are indications of a lack of continuity that must be corrected expeditiously by theater logisticians.

The conventional view of resource distribution is that they are moved from the rear forward. This traditional concept of forward impetus²⁴, again, has value when regarded at the strategic level but may not always hold true at the operational. Absent Host Nation Support (HNS) arrangements, goods and equipment generally flow from CONUS to the theater. At the operational level too, material generally flows from the rear to the forward areas for consumption or employment but this is not always necessarily true. Once again, the Gulf War of Kuwaiti liberation provided us with an innovative approach to operational

logistics that was not as conservative logisticians might have designed. Logistics bases were placed forward, sometimes far forward, of the most forward deployed combat troops to support the "end-around" western flanking maneuver by U.S. forces. This apparent violation of the principle of forward impetus was appropriate and responsive to the quickly moving offensive forces. Dogmatically adhering to accepted logistics doctrine by fashioning a theater logistics system using classic forward impetus might well have hindered the mobility of the offensive forces. While the benign threat allowed this violation of forward impetus in the Gulf War, commanders and operational logisticians must be flexible and creative and not slavishly follow logistics principles that may not apply at the operational level.

The third pillar supporting sustainment of theater combat operations is RESPONSIBILITY. This pillar concerns itself primarily with logistics command and control issues. Unity of command is every bit as important to the theater logistician as it is to the warfighting CINC. There simply must be a theater logistics kingpin. That kingpin and his boss, the CINC, must view themselves not as customers of the individual components logistics systems. Rather, they must view themselves as directors and controllers of theater logistics matters. The logistics kingpin must take his directive authority over logistics seriously and not be afraid to use it. The operational logistician, frequently in close consultation with the CINC, must

be prepared to set priorities and make allocations of resources between units in consonance with the CINC's intent or plans. In order to accomplish this and his other command and control duties, the operational logistician must have set up a viable system or program to gain visibility over all important logistics functions and material throughout the theater.

Perhaps the most important responsibility of the theater logistician is what we may call "suboptimization avoidance". This should be distinguished from "optimization" as optimization implies a scientific or quantitative calculus to balance variables that is not intended. Orchestrating all theater logistics functions to ensure that optimizing one function does not adversely effect another is what may be referred to as suboptimization avoidance. It is perhaps best illustrated with an example from the Gulf War. In an effort to take maximum advantage of the limited strategic sealift, Gulf bound sustainment supplies -- regardless of the ultimate destination -- were containerized for shipping. These multi-consignee containers ensured ships were sent full and allowed significant manpower savings at ports of embarkation. The transportation function had been effectively optimized. When the multi-consignee containers were received in the theater, they demanded a huge effort to sort for the numerous units for onward shipping. The result was not an overall savings of manpower but a movement of manpower requirements from the stateside POE's to the place where it was least needed - the theater of operations. Theater

ports of debarkation became clogged with frustrated shipments and units undoubtedly ordered duplicate material under high priority requisitions thus spreading the suboptimization to the air channels. In this case, the Central Command J4 set a limit on the proportion of multiple consignee containers that could be shipped from CONUS and directed the components to adhere to his limit.

The last of our four pillars is READINESS. This is not meant in the sense of preparedness (which is not such a bad characteristic of an operational logistics network) but in the sense of foresightedness or anticipation. Both operational commanders and operational logisticians must be adept at anticipating requirements. This skill is largely acquired through experience gained at the tactical level and it is rare that significant requirements are completely unanticipated.

More important than the anticipation of requirements at the theater level is the capability to foresee the limitations that logistics decisions may exert on subsequent operations. Just as a chess player must think ahead to ensure that his moves do not restrict him later, theater logisticians must foresee the effects of their actions. We will turn to the 1991 Gulf War for a final illustration of operational logistics principles. The initial placement of troops for Operation Desert Shield was not done in anticipation of the offensive flanking maneuver. The disposition of the 7th and 18th Corps were such that in order to execute the flanking "end run" they had to be repositioned. While this may

not sound like a large undertaking, the two units had to cross each other at the "mother of all intersections" in the desert. Skillful execution of the repositioning prevented any limitations on combat operations but this certainly seems to be an example of poor logistics foresight.

CHAPTER 5

CONCLUSION

Throughout history, great military thinkers have recognized the operational level of warfare. The total integration of logistics with combat operations at the operational level and the recognition that logistics would govern what is militarily possible have been appreciated by scholars since the times of Sun Tzu.

The relatively recent recognition of the operational level of war by the U.S. military has greatly enhanced our capability to respond to crises in the post cold war era. The appreciation of the critical role that logistics issues play in the operational art has lagged. Despite the refinement of operational concepts, U.S. military emphasis on logistics has continued to be at the strategic and tactical levels to the detriment of developing logistically supported operational doctrine. In general, U.S. operational commanders are not equipped with a full appreciation of logistics and logisticians have not been properly exposed to operational concepts.

With the success of the 1991 Gulf War which was so heavily dependent on logistics in an austere environment, a greater appreciation for operational level logistics has emerged. This emergence has been accompanied by a small but growing body of logisticians exposed to the operational art in Joint Professional Military Education curricula.

The principles of logistics contained in joint logistics

doctrine are a legacy of a logistics focus on the strategic and tactical levels and they do little to focus logisticians on the operational art. It is possible however, to construct a broad conceptual framework of four pillars -- Relationship; Resources; Responsibility and Readiness that can be used as guideposts for logisticians to focus their thinking at the operational level.

NOTES

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8. ibid p. 131-132
9. Clausewitz, Carl von; On War; Edited and translated by Howard, M. and Paret, P.; Princeton; Princeton University Press; 1976; p. 343 and 345.
10. ibid p. 339
11. Wavell, Archibald; Generals and Generalship; New York; Macmillan Co.; 1941; p. 39
12. ibid p. 42
13. ibid
14. Eccles, H.E.; Military Concepts and Philosophy; New Brunswick, NJ; Rutgers University Press; 1965; p. 72
15. Eccles, H.E.; Logistics in the National Defense; Harrisburg, PA; The Stackpole Co.; 1959; p. 144
16. Eccles, H.E.; Logistics, What is it?; U.S. Naval Institute Proceedings; Annapolis, MD; June 1953; p. 648
17. See Pagonis, W.G.; Moving Mountains: Lessons in Leadership and Logistics from the Gulf War; Boston; Harvard Business School Press; 1992; p. 121. Pagonis suggests that when he approached Swartzkopf with his intention to plan for supporting offensive operations

Swartzkopf said: "(a) prudent commander should always be looking ahead" then flashed that "now famous smile". The implication is that Swartzkopf had not included his chief logistician in plans for Operation Desert Storm (but the logistician was smart enough to figure it out unilaterally).

18. Joint Pub 4-0; pp. II-1 through II-3

19. See Huston, J.A.; The Sinews of War: Army Logistics 1775 - 1953; Washington; Office of the Chief of Military History; 1966; p. 656

20. *ibid* p. 656

21. *ibid* p. 657

22. Eccles; p. 102

23. Huston; p. 664 - 665

24. See Huston; p. 666

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