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Naval War College
Newport, Rhode Island

**Force XXI Logistics:
Operational Distribution
on the Future Battlefield**

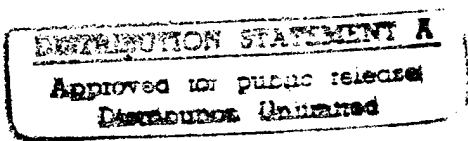
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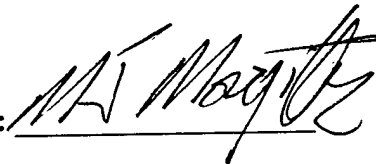
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**A paper submitted to the Faculty of the Naval War College in partial
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**The contents of this paper reflect my own personal views and are not
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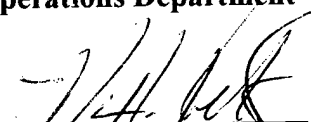
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ABSTRACT of

Force XXI Logistics: Operational Distribution on the Future Battlefield

The future Armed Forces of the United States will be broadly based upon four emerging operational concepts: Dominant maneuver, precision engagement, focused logistics and full dimension protection.

This paper will discuss a specific aspect of one of these emerging concepts: operational distribution in focused logistics. Focused logistics will harness information technology and related management principles toward the goals of increasing responsiveness while reducing the cost and 'footprint' of logistics forces in a theater of operations. Across all levels of logistics this new paradigm will result in fewer support personnel resulting in lower manpower costs, lower quantities of stocked supplies, lower storage volumes and associated costs.

This is a dramatic departure from our historical logistics paradigm which was based upon mass and redundancy. This departure from the past has benefits, but it also has largely unexplored potential risks.

Operational distribution is the key to making focused logistics work on the future non-linear battlefield. The concept for operational distribution in focused logistics does not take into account the future battlefield environment or our recent experiences in Vietnam, Somalia, and Haiti. It is through the exploration of the benefits and risks of the concept, along with the full appreciation for the complexity and friction of the future battlefield, that this paper hopes to provide some valuable discussion.

INTRODUCTION

Force XXI logistics is a radical departure from our historical logistics processes that emphasized “huge, complex and successful logistic support systems. Those systems worked , but they were not efficient and an unnecessary expenditure of our national resources resulted.”¹

In Joint Vision 2010 the Chairman of the Joint Chiefs of Staff outlines the logistics concept of Armed Forces of tomorrow. Focused Logistics is defined as:

“The fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets even while enroute, and to deliver tailored logistics packages and sustainment directly at the strategic, operational, and tactical level of operations. It will be fully adaptive to the needs of our increasingly dispersed and mobile forces, providing support in hours or days versus weeks. Focused logistics will enable joint forces of the future to be more mobile, versatile, and projectable from anywhere in the world...The combined impact of these improvements will be a smaller, more capable deployed force. It will require less support with a smaller logistics footprint, decreasing the vulnerability of our logistics lines of communication.”²

Applicability and Scope

This paper will focus on one particular aspect of focused logistics, operational distribution. The term operational distribution is derived from the Army definition of **operational logistics** as the level that:

*“ties tactical requirements to strategic capabilities in order to accomplish operational plans. It encompasses support required to sustain joint and/or multinational campaigns and other military activities within an area of responsibility. The primary focus of the operational logistician will be on reception, discharge, onward movement of forces, positioning of facilities, materiel management, movement control, distribution, reconstitution, and redeployment.”*³

And **distribution** as it applies to operational distribution is defined as “a function of visibility, management, and transportation. The geographic combatant commander is responsible for maintaining an **effective theater distribution network...**”⁴ Operational distribution incorporates the four key focused logistics initiatives:

- Distribution Management (Battlefield Distribution)
- In Transit Visibility (ITV) and Total Asset Visibility (TAV)
- Velocity Management (VM)
- Enhanced Computer Information Management Systems

Operational Distribution Terms

Battlefield Distribution

“Victory is the beautiful, bright colored flower. Transport is the stem without which it could never have blossomed.” Sir Winston Churchill, The River War, 1809⁵

Battlefield distribution is the Army initiative to improve the distribution of supplies on the battlefield. It joins supply, maintenance, and transportation management into a single responsibility. It incorporates: In Transit Visibility (ITV) and Total Asset Visibility (TAV); Velocity Management (VM), enhanced logistics information systems, including the Objective Supply Capability (OSC), and SARRS-O, and improved maintenance processes.⁶

In Transit Visibility (ITV) and Total Asset Visibility (TAV)

“It is very necessary to attend to all this detail and to trace a biscuit from Lisbon into a man’s mouth on the frontier and to provide for its removal from place to place by land or by water, or no military operation can be carried out.” The Duke of Wellington, 1811⁷

ITV applies technology to provide visibility of supplies while in transit to and from key logistics nodes. ITV applies a variety of automated and manual scanning processes to provide this capability. TAV has as its goal the near real-time visibility of all stocks.⁸ This

visibility is limited to centralized management personnel in Materiel Management Centers (MMC) at the Division level and above. The visibility of stocks allows for the lateral movement of stocks, and the increased ability to use locally available stocks before ordering stocks out of theater. This process relies upon lateral transportation and local part identification.

Velocity Management

*“Mobility is the true test of a supply system.” Captain Sir Liddell Hart,
Thoughts on War, 1944⁹*

As it was initially intended, VM was only one of three broad strategies. The other two were first, focusing logistics management of the entire system at improving responsiveness and second, redesigning weapon systems to reduce the logistics burden.¹⁰

“The application of velocity management principles is reducing administrative lead time, thus getting supplies to customers faster, while reducing wholesale stockage levels. The ultimate goal of velocity management is getting logistics support in the hands of the soldier as fast as any commercial firm would, while providing a hedge against unforeseen interruptions in the logistics system.”¹¹ VM processes apply to all supplies, but especially to high cost repairable components. VM is sometimes mistakenly called the pipeline concept or in civilian terms, just in time inventory. Drastically reduced stockage levels will be offset by increased maintenance processes (relying on cheaper sub assemblies) to achieve better responsiveness. As a result stocks of critical repairable components will be lower in a theater. VM assumes that a faster system is more “robust” and therefore better able to adjust to rapid changes in demands.

Enhanced Computer Information Systems

“Movement control involves a vast amount of information and programming and is closely related to the control of requirements and requisitions.”¹²

An example of the growing trend and effectiveness of logistics information systems is the Logistics Anchor Desk (LAD). The LAD was under development but unavailable for Haiti, but did deploy to support operations in Bosnia. “One of the most used tools in LAD is the Knowledge Based Logistics Planning Shell (KBLPS), which utilizes artificial intelligence tools to develop and analyze transportation and supply distribution.”¹³ This system provides analysis of planned logistics systems and develop realistic alternatives in real-time. The result can be a reduced logistics foot-print and the early identification of potential logistics excess, as was the case in the planning for Bosnia. The KBLPS system can help identify problems and resource shortfalls.

The Future Battlefield Environment and Force XXI Operations

Future contingency operations will likely take place in an environment that is more lethal, chaotic, opportunistic, asymmetric and public than ever before. It will not matter if it is high or low intensity. Future contingencies are likely to be regional and increasingly conducted in an urban setting that may hinder the use of our precision weapons.¹⁴

Threat soldiers will use a variety of weapons and tactics. Often, they will be indistinguishable from the urban chaos around them. They will attack logistics nodes—

because of the relative ease with which these targets can be neutralized and because of the disproportionate benefits these attacks accrue.¹⁵

Force XXI operations are characterized as non-linear, with operations occurring throughout the battle-space.¹⁶ The logistician of tomorrow will function by projecting capabilities from secure nodes along air, land and sea nodes that may or may not be controlled. Much of this support will be to increasingly dispersed units operating semi-autonomously over great distances. The high tempo of operations will make situation awareness for all forces an absolute necessity for survival.

The logistics concept must work across the “spectrum of conflict” from Operations Other Than War to war. The process must function when “logistics elements may be employed in quantities disproportionate to their normal military roles.”¹⁷ The dispersion of supported units across an ever increasing battle-space will make the logisticians job harder and more dangerous than ever before.¹⁸

DISCUSSION

“Free supplies and open retreat are two essentials to the safety of an army or a fleet.” Rear Admiral Alfred Thayer Mahan, Naval Strategy, 1911¹⁹

Now that we have defined the terms of operational distribution it is important to draw lessons from our historical experience. These lessons from the past may provide an indication of the success or failure of operational distribution.

Lessons of the Past

The Lessons

The book "The Lifeblood of War" outlines six general lessons from modern war which raise important questions as to the validity of the operational distribution concept²⁰:

- Logistics and support are a substitute for weapons system mass
- Materiel expenditure rates generally exceed prewar predictions
- Friendly logistics are vulnerable. Relatively more vulnerable, especially when the enemy does not possess the same level of technical sophistication
- Speed of deployment and regional infrastructure are unpredictable and key to the ability to surge capacity and ability to deploy rapidly
- "There is considerable evidence that overly complex, demand "pull," and "supplier-managed" systems are less effective, and ultimately more costly, than pushing a steady stream of "oversupply" forward to the front, maintaining large numbers of forward deployed stocks and relying on "user-managed" systems."
- Environmental factors have a tremendous effect on the variability of logistics requirements in a theater.

Logistics in Vietnam:

Vietnam provides the only modern, medium-intensity, non-linear battlefield example in US history to date. It contains many lessons that may indicate problems with the focused logistics operational distribution concept.

In Vietnam, convoy operations were under the constant threat of enemy action, to the extent that, in 1967, most of the 4th Infantry Division's armored assets were conducting convoy escort operations to secure ground Lines Of Communication (LOCs).²¹ Securing LOCs and escorting convoys were major missions for all armored forces in theater.²² To the point that additional armored units had to be deployed to meet operational objectives. The LOC security mission had several negative effects: first, armored units increased their exposure to mines, road mileage dramatically increased, supply and maintenance requirements increased.²³

In his monograph, *Mounted Combat in Vietnam*, General Starry criticized the centralized logistic system under 1st Logistical Command in Vietnam. He states, "It is amazing that the system was expected to work in a war of movement, in which armored units traveled great distances in short periods of time."²⁴ He goes on to say that, "Examples of the failure of the rigidly structured area support system to sustain adequately a constantly changing troop concentration are endless."²⁵ In Vietnam the "conventional pattern of a combat zone and communication zone did not exist."²⁶

Many problems resulted from the centralization and distances along unsecured LOCs. One of the worst problems was with ammunition, which could not be supplied to meet (pre-war forecasted) expenditure rates.²⁷ With this experience in mind we expect more of the same problems in the high threat non-linear future battlefield.

Benefits and Risks of Operational Distribution

Now that we have outlined the definitions, the future battlefield environment, and historical precedent, we will next focus on the risks and benefits of operational distribution.

Exponentially Increased Transportation Requirements.

A centralized transportation system characterized by "hub and spoke" organizational structures and high demands, to numerous dispersed supported units will require a substantial increase in low volume transportation. At the same time, we are moving toward a reliance upon Palletized Load System (PLS) trucks for the bulk of our logistics inter-nodal transportation on the battlefield. PLS trucks have the capability to transport 33 tons on two flat-racks of 16.5 tons each. This system was designed to move the high tonnage and volume ammunition on the battlefield.²⁸ To enable focused logistics to work while reducing stocks of supplies, shipments will have to be more frequent, and as a result they will be smaller. However, the transportation workhorse, Light/Medium truck company, is disappearing from the force structure just as more are needed to implement the focused logistics concept.²⁹

Velocity Management is Not Based on Operational Analysis or Experience:

A recent RAND Corporation Study on VM compared the distribution process of the Army to civilian industries. It did not, however, take into account effects in the operational theater since, "Data limitations precluded estimating these latter segments (theater of operations) of the distribution process."³⁰ This lack of operational information should be a grave concern.

The RAND studies, which serve as the foundation for the focused logistics concepts, also miss the point in their comparison of a civilian firm and the military. A civilian firm does not have to move its industry along with its distribution function and its customers to begin the process of distribution. A civilian firm does not share its

transportation assets with its customers. Moreover, a civilian firm does not suffer from the same level of operational variability. Simply put, competing companies are not running trucks off the road, hijacking, and destroying them to improve profit.

RAND is correct in their characterization of the distribution process as hopelessly complex, and disjointed.³¹ They correctly point to a need for a dramatic improvement in responsiveness.³² A key reason for this is the loss of mobility and identification of parts at the forward storage areas.

A lost lesson from Desert Storm is that Direct Support Units often lost documents which indicated the ultimate customer for supplies, and were often unable to identify parts in their possession.³³ A lack of adequate, mobile storage capacity may make all the VM processes irrelevant. Operational distribution may also be effected by the theater itself where the infrastructure may not support the high velocity of logistics operations required to make VM processes work.

Information Dependence, Management Sophistication

“Our most fatal error would be to depend wholly on our own supposed technical superiority for the preservation of our security and for the accomplishment of our objectives.”³⁴

LAD and KBLPS are emerging systems with tremendous benefits for planning and preparing of operations. The problem with our increasing reliance on information systems lies in our level of training and sophistication in using these systems. LAD and KBLPS are not “systems” in the weapon system definition. The training, as with most logistics information and management systems, does not have dedicated operating personnel and

training. Information processes do offer some assistance in managing and predicting requirements, however someone must have the experience to tell when the decision aid is wrong.

Secure Lines of Communication and Force Protection

“Nine times out of ten an army has been destroyed because its supply lines have been severed.” General Douglas MacArthur, 23 August 1950, to the Joint Chiefs of Staff³⁵

An uninterrupted flow of logistics is critical to the operational campaign.³⁶ Air and Sea LOCs are maintained to supplement intratheater ground LOCs.³⁷ Under the focused logistics concept this changes because all LOCs become interrelated and critical. The concept of focused logistics would seem to move us away from establishing a theater logistics base.

The ability for our enemy to interdict LOCs especially on the non-linear battlefield of the future will increase both the cost of, and risk to, support on the battlefield of the future. Somalia, Haiti, and Bosnia operations are all thought to be examples of the emerging focused logistics paradigm. To some degree this is true. But, all of these operations were low intensity against minimal opposition. However, in each case logistics units required additional security elements to accomplish routine missions.³⁸

Maintenance Returns

As we have already stated the core principles of VM is to reduce stocks and to increase velocity with which supplies move through the supply system. In the VM model, maintenance returns of repairable items are needed more rapidly than ever and repair cycle

time (the time from breakdown to repair) is to be faster than ever before. Shortfalls in critical spares will be offset by faster repair cycle time.³⁹ Intermediate maintenance will need to be more effective and responsive. The dependency upon return of unservicable components is the key problem. To overcome this problem in Operation Desert Shield and Desert Storm (DSS), the Army stocked overages of critical reparable. Still it was not enough and some maneuver was limited by a shortage of key components.⁴⁰

In wars from antiquity to our recent operations, (Desert Shield and Storm, Provide Comfort, Somalia, and Haiti) soldiers resorted to scrounging and cannibalization to get the supplies they needed. Just as in Vietnam, teams where unit teams were sent to major depots to physically locate parts and return with them to their unit.⁴¹ Scrounging was raised to a “high art form” in Desert Shield and Storm and in every major operation to date, even those that used VM techniques and procedures.

Operational Mission Impact

“Since Logistics is the link between the national economic system and the military system it must partake of the characteristics of both. In other words, a logistics system must be in harmony with its supporting economic system and with the structure and employment of the combat forces it supports.”⁴²

Primary logistical responsibilities of the operational commander will be reception, discharge, onward movement of forces, positioning of facilities, materiel management,

movement control, distribution, reconstitution, and redeployment. The operational commander will need to make hard choices. Focused logistics promises to reduce the size of the deployed force and its supporting logistics infrastructure. This will improve deployment operations but, may create risk during the sustainment phase of the operation. It is important to remember, as stated in Joint Publication 4-0, Doctrine for Logistic Support of Joint Operations, that "A combat force without logistics support is **immobile** and **powerless**."⁴³

It is the role of the operational commander is to determine the level and ratio of combat to CSS forces prior to hostilities. A centralized transportation system characterized by "hub and spoke" organizational structures and high demands to numerous dispersed supported units will require a substantial increase in low volume transportation. However, light/medium truck companies are disappearing from the force structure just as more are needed to implement the focused logistics concept. As fewer of these assets exist, the operational commander will need a greater proportion of these scarce assets to meet requirements.

Velocity Management offers real potential for savings while improving operational maintenance processes. The problem will be maintaining the flow of properly identified unservicable materiel. To overcome this problem in DSS, we had stocked overages of critical reparables. Still, it was not enough and some maneuver was limited by a shortage of key components. VM compares the distribution process of the Army to civilian industries. It does not however take into account effects in the operational theater. The RAND studies, which serve as the foundation for the focused logistics concepts miss the point in their comparison of a civilian firm and the military. They correctly point out a

need for dramatic improvements in responsiveness. Without improvements in mobile storage capacity all the VM processes may be operationally irrelevant. Operational distribution may be highly variable, effected by the theater itself where the infrastructure may not support the high velocity of logistics operations required to make VM processes work.

Information systems like the LAD, along with KBLPS, may offer an increased planning capability with less personnel in a shorter time frame. The result can be a reduced logistics foot-print and the early identification of potential logistics excess. The problem lies in our level of training and sophistication in using these systems.

Under Focused logistics and operational distribution all LOCs become interrelated and critical. They would seem to move us away from establishing a theater logistics base. The ability of our enemy to interdict LOCs, especially on the non-linear battlefield of the future will increase both the cost of, and risk to, support on the battlefield of the future

The ITV and TAV systems may provide a rapid source of information to speed the processes of deployment, reception, staging and onward integration. In this capacity they may, more than any other processes, create real benefits for the operational commander.

CONCLUSION

“An adequate supply system and stocks of weapons, petrol and ammunition are essential conditions for any army to be able to stand successfully the strain of battle. Before the fighting proper, the battle is fought and decided by the Quartermasters.” Field Marshal Erwin Rommel, quoted in Wavell, Soldiers and Soldiering, 1953⁴⁴

The development of this paper focused on operational distribution which incorporates many of the key focused logistics processes and the three key logistics sub-processes of: supply, maintenance, transportation, information management. As we have seen these four related areas are most effected by operational distribution and contain the most risk for the operational commander. In combination they set out to reduce operational stocks in a theater, making the theater no longer self sustaining.

There are obvious advantages with a system that improves the speed and responsiveness of logistics. Focused logistics using information systems and velocity to replace mass has the real potential to revolutionize the way in which support is provided to the operational commander. The area of their study, and for improvement is the strategic logistics leg. But this level of logistics is also the least likely area for improvement due to inter-service and congressional considerations and interference. VM does not take into account the operational distribution experiences of major units in a theater from Vietnam to DSS.

Focused logistics does not address warehousing identification and mobile storage capabilities. Worse, in attempting to build a more responsive strategic logistics process we may have created a system which, when applied at the operational level, may in fact be less responsive with higher risk to the operational commander.

In the future, the operational commander will, more than ever, have to make hard decisions about the ratio of logistics forces to combat forces. The Army force will likely be the ground logistics provider for joint and coalition forces. Therefore, the CINC must have a robust, proven logistics base available immediately, upon which to build his theater

distribution network. The CINC will need more transportation assets within theater and these will need to move forward in the Time Phased Force Deployment Data (TPFDD) process, actually preceding combat units. To assist him, the TPFDD process will need to be more responsive as units required in the theater may change even while units are in route. Information systems will assist in these processes but, until we begin treating information systems as "true systems" with associated institutional training and assigned personnel these systems will not reap the benefits advertised.

Operational distribution processes must take into account the effect of changes to the Army system which relate to this joint and combined environment. The danger in the near term is that we are caught between paradigms. Our force structure increasingly supports high-technology, information-based logistics processes with fewer soldiers and redundancies. But, they are doing so without the seamless integration of transportation, management, and operational distribution with national systems.

Many of these concepts are measures to find a cheaper way to do business. A danger is that focused logistics will not be robust enough to survive on the battlefield of the future. We can find economies. However an emerging concept for logistics must match the maneuver concept. Given that the emerging concepts cannot be fully tested in peacetime, the prudent strategy would be to keep some of the existing redundancy in existing operational distribution processes, while fully exploiting the strategic benefits of focused logistics and operational distribution.

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Endnotes

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- ¹ Command Logistics, xi
- ² *Joint Vision 2010*, 24, 25.
- ³ TRADOC PAM 525-5,
- ⁴ Joint Pub 4-0, I-9
- ⁵ Warriors' Words, 259
- ⁶ Battlefield Distribution
- ⁷ Warriors' Words, 238
- ⁸ Precision Guided Logistics, 39
- ⁹ Warriors' Words, 240
- ¹⁰ Velocity Management, v
- ¹¹ Army Green Book, 130
- ¹² Command Logistics, 244
- ¹³ Joint Forces Quarterly, 85 also, "When the Army was preparing to establish the intermediate staging base in Hungary, the standard for their facilities was [the ability to support] 10,000 soldiers. KBLPS showed that the number [requiring support] would not exceed 6,000. Thus not only was the physical size of the staging base reduced, so were the support requirements for meals, water, and beds." Maintaining the current system of on-the-job or initial fielding training of available assigned personnel as an additional duty will cause increasing problems as these systems are linked into ever more capable networks and they are relied upon increasingly to make far-ranging management decisions.
- ¹⁴ US Army MOUT Study, and ODSCINT Brief
- ¹⁵ US Army MOUT Study, and ODSCINT Brief, USMC Commandants Warfighting Lab
- ¹⁶ Land Combat in the 21st Century, 17 also, "Force XXI operations are characterized by non-linearity, executing tasks across the entire battlespace rather than massing combat power at the Forward Line Of Troops (FLOT). Non-linearity requires soldiers and leaders to possess greater situational awareness, allowing risk to be accepted with space between units rather than more traditional contiguous operations. Non-linearity also increases the requirement of each divisional element, maneuver, CS and CSS for all-round security."
- ¹⁷ JP 3-07, iv-9
- ¹⁸ Force XXI joint Venture CSS brief
- ¹⁹ Warriors' words, 94
- ²⁰ Lessons of Modern War, 396, 397.
- ²¹ Starry, Armored Combat in Vietnam, 107
- ²² Ibid, 74
- ²³ Ibid, 106-111
- ²⁴ Ibid, 182
- ²⁵ Starry, 183
- ²⁶ Lifeblood of War, 197
- ²⁷ Ibid, 196
- ²⁸ Army Greenbook

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- ²⁹ Interview with MAJ Bob Stanley, Logistics Planner, 1st COSCOM, Ft Bragg, NC
- ³⁰ Improving DOD Logistics, 20
- ³¹ RAND Issue Paper, Materiel Distribution, 10
- ³² RAND Issue Paper, Materiel Distribution, 20
- ³³ Personal experience as Maintenance Officer and interviews of maintenance and supply personnel returning from Desert Shield and Desert Storm
- ³⁴ Command Logistics, 245
- ³⁵ Warriors' Words, 95
- ³⁶ Joint Publication 4-0 and Army FM 100-5
- ³⁷ Army FM100-5, 12-9
- ³⁸ Somalia AAR, II-9-9, II-11-7 to II-11-11, Haiti AAR, 207-234, additional personal experience as Plans and operations Officer, G-3, 1st Corps Support Command, Port Au Prince Haiti
- ³⁹ RAND, Precision Guided Logistics, pxvii
- ⁴⁰ Gulf War Air Power Survey, 111
- ⁴¹ Starry, 184
- ⁴² Eccles Command Logistics, 247
- ⁴³ Joint Publication 4-0, II-5
- ⁴⁴ Warriors' words, 240