

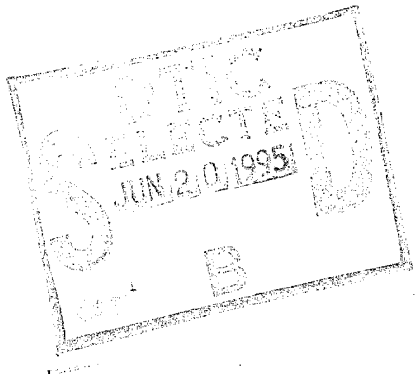
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**U.S. ARMY LOGISTICS IN THE 21ST CENTURY
AND THE CHALLENGE OF CHANGE**

BY

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The ongoing doctrinal and conceptual debates over Force XXI, will profoundly impact not only on how the U.S. Army of the 21st Century will fight but also how it will be logistically supported and sustained. The purpose of this paper is to examine logistics lessons learned from Operation Desert Shield/Storm (ODS) in the context of emerging Force XXI logistical concepts and to provide recommendations concerning logistics doctrine, organizations and materiel requirements for the U.S. Army of the 21st Century.

When ODS logistics lessons learned concerning strategic sealift, deployment planning, host nation support, coalition responsibility sharing, transportation vehicle shortages and support of high tempo mechanized operations are overlaid on the emerging Force XXI logistics assumptions, threats and required capabilities then the resulting recommendations are far more evolutionary than revolutionary.

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Introduction - The Challenge of Change

Logistics is the process of planning and executing the sustainment of forces in support of military operations. It includes the design, development, acquisition, storage, movement, equipping, distribution and evacuation functions of supplies, field services, maintenance, health service support, personnel and facilities.... Logistics cannot win a war but its absence or inadequacy can cause defeat.¹

FM 100-5 Operations
June 1993

"The foundation of Operation Desert Storm was laid in the immediate aftermath of Vietnam."²

Conduct of the Persian Gulf War
ODS Final Report to Congress, April 1992

The U.S. Army is entering a period of fundamental and momentous change. As we move from a post-cold war Army into the future we face a simple and critical question -- how will the U.S. Army fight, logistically support and win the nation's wars in the 21st Century? As Army logisticians the answers to these questions are at once vital to our nation's security and filled with the most daunting challenges and sublime opportunities.

On 23 February 1991 in the predawn desert of Saudi Arabia and Kuwait, UN coalition forces led and spearheaded by two U.S. Army Corps executed one of the most stunningly successful and overwhelmingly effective ground attacks in modern warfare. The resulting "100 hour war" and decisive defeat of Iraqi forces stemmed from a brilliantly planned and executed theater campaign

that superbly orchestrated the combined and joint combat and logistics power of the U.S. and coalition forces. In one campaign the strategic and operational concepts embodied in the U.S. Army's and U.S. Air Force's Air Land Battle Doctrine and the emerging doctrine of joint warfighting as envisioned in the Goldwater-Nichols Act of 1986 were validated. Also, and perhaps more importantly, Operation Desert Shield/Storm (ODS)³ represented the culmination of an almost twenty year intellectual and doctrinal odyssey that had fundamentally transformed the U.S. Army after its withdrawal from the Republic of South Vietnam and South East Asia in 1975. It is not an exaggeration to suggest that the impetus for the changes in the U.S. Army that had occurred over the past two decades and which had led to the overwhelming defeat of the Iraqi Army stemmed, in large measure, from the lessons learned of the Vietnam War.⁴ However, in today's post-cold war world of regional, multi-polar military threats and political uncertainty, the U.S. Army again wrestles with the challenge of change to determine the course we will follow as we enter the 21st Century.

The purpose of this paper is to examine the U.S. Army's ODS logistics lessons learned in the context of emerging future force logistics concepts and to provide recommendations concerning future U.S. Army logistics doctrine, organizations, and materiel requirements for the 21st Century. The scope of this study will include an examination of key strategic and operational ODS logistics lessons learned and an analysis of conceptual thrusts

and basic assumptions concerning future threats, support environments, and required capabilities that are being developed and proposed in current U.S. Army Louisiana Maneuver, Force XXI and U.S. Army Training and Doctrine Command future force doctrinal concepts.

Predicting the future is both risky and problematic. It is risky because academic miscalculations and intellectual biases are paid for in blood and the irrevocable loss of national treasure. It is problematic because in the history of the U.S. Army we have faced similar periods of revolutionary and radical change and have met these challenges with both inspiring successes and notable failures. While the U.S. Army's post-Vietnam transformation serves as a recent example of how an Army accomplishes successful change, the post-World War II era of rapid demobilization accompanied by severely constrained budgets during a period when the U.S. enjoyed nuclear superiority and status as the world's sole superpower is eerily similar to today's strategic landscape. The Army's failure in the late 1940's to meet the challenges of the future by maintaining sufficient, combat ready conventional forces (in favor of emphasizing strategic nuclear warfare) had brutal consequences in the Korean War of 1950-1953. Today as an Army, we are at a critical juncture. The ongoing doctrinal and conceptual debates over Force XXI, the U.S. Army of the future, and future-battle

operational dynamics and concepts will profoundly affect, not only, how the Army of the 21st Century will fight but also how it will be logistically supported and sustained. When the logistics lessons learned from Operation Desert Shield/Storm are overlaid on the emerging future Force XXI logistics assumptions, future threats and required capabilities, the resulting analysis may provide valuable clues concerning future logistics doctrine, force structure and materiel.

Operation Desert Shield/Storm Logistics Lessons Learned

"One hundred hours of ground combat was too short a period to form comprehensive judgements about specific strengths or shortcomings....Nonetheless, the Operation Desert Storm victory was enabled by many years of thought, realistic planning, new doctrinal concepts, new unit designs and structure, an investment strategy for equipment modernization, and a training strategy for all components."⁵

Conduct of the Persian Gulf War ODS Final Report to Congress

An analysis of ODS logistics lessons learned poses a number of interesting challenges. The crucial, and perhaps most vexing question is whether ODS really serves as a valid predictor for future warfare or was it simply an unique campaign, that because of its peculiar missions, enemy, terrain, geography and theater infrastructure render it of limited value to logisticians in building towards the future? As with most difficult questions, the answer lies in-between.

In the planning and execution of ODS logistics operations, U.S. Army logisticians were favored by many fortuitous factors that contributed to the overwhelming success of the campaign. In addition to the key advantages of a clear mission statement and a rehearsed and developed campaign plan, the allies benefited greatly from the Iraqi's initial unwillingness and subsequent inability to attack or interdict allied shipping, air and ground transport, seaports, airfields, supply routes or logistics bases. Additionally, the availability of modern Saudi Arabian seaports,

airfields, highways, warehouse facilities and readily available host nation support were critical to the success of ODS logistics plans and operations.⁶ However, when considering the above factors, probably the single most critical allied logistics advantage was time.⁷ The seven months between August 1990 and February 1991 in which U.S. and coalition forces were able to build, unhindered, theater combat and logistics power and prepare for the ground campaign of February 1991 were decisive. Iraq's failure to continue their initial attacks into Saudi Arabia to seize key sea and aerial ports, represented a key strategic miscalculation. Further, the rapid deployment of initial allied air and ground forces during Operation Desert Shield (defensive operations conducted from 8 August 1990 to 16 January 1991) and the subsequent highly successful allied air campaign from 16 January to 24 February 1991 assured a secure and stable theater rear area which greatly facilitated the allied build-up.

While the impact of these factors may have been decisive they do not invalidate the significance of the campaign's logistics lessons learned or their value in predicting future Army logistics imperatives. To the contrary, in spite of these many advantageous factors, there were significant logistics shortfalls, lessons learned and problems identified during ODS. It is only when the theater-unique factors are understood in context with the theater logistics lessons learned that ODS is relevant as a predictor for future logistics doctrine, organizations, materiel, equipment and technologies.

The following major ODS logistics lessons learned and issues have been distilled from the after-action reports of The Department of Defense, U.S. Central Command, 22d Support Command (SUPCOM) and the U.S. Army Deputy Chief of Staff, Logistics, and are generally presented and sequenced in the following order:

Operation Desert Shield (8 August 1990 - 16 January 1991)
Planning, Preparation and Deployment

Operation Desert Storm (17 January - 15 March 1991)
Preparation and conduct of ground offensive operations

As mentioned, this paper focuses primarily on the strategic and operational levels of logistics. For the purpose of this study tactical logistics is defined in U.S. Army Training and Doctrine Command Pamphlet 525-200-6, Combat Service Support Battle Dynamic Concept as, "the synchronization of all logistics activities required to sustain soldiers and their systems."⁸ Operational level logistics, "ties tactical requirements to strategic capabilities in order to accomplish operational plans. The primary focus of the operational logistician is on reception, discharge, onward movement of forces, positioning of facilities, materiel management, movement control, distribution, reconstitution and redeployment."⁹ And finally, strategic logistics, ... "includes the nation's industrial/economic base and Department of Defense's link to its military forces. Strategic logistics is primarily the purview of the DOD, individual services, and non-DOD governmental agencies with support from the private sector. The strategic logistician's focus is on

requirements determination, personnel and materiel acquisition, repositioning, stockpiling strategic mobility and reconstitution in support of force mobilization, deployment, redeployment and demobilization."¹⁰

The following strategic and operational ODS logistics lessons learned are neither intended to be all inclusive nor to faithfully list logistics deficiencies from the major command's after action reports. Instead the following lessons learned represent a distillation of critical problem areas and issues that will certainly impact on the evolution and development of future logistics doctrine, force structures and materiel.

Operation Desert Shield (8 Aug 90 - 16 Jan 91) Planning, Preparations and Deployment

The challenges facing LTG Pagonis (J-4, U.S. Army Forces Command-USFORSCOM) and his planning staff on 2 August 1990, were immense. The requirement to simultaneously assess the Saudi Arabian theater infrastructure, plan and begin executing the deployment, reception, onward forward movement and initial theater sustainment for all deploying U.S. Army forces was a daunting task."¹¹ Considering the imminent Iraqi threat, deployment distances of over 6000 nautical miles (NM) by air and 8400 NM by sea and an initially immature Saudi Arabian logistics infrastructure the initial deployment phase can be classified as an unqualified success. Key lessons learned and problem areas identified during this phase include the following:

- USCINCCENT Initial Deployment Decisions
- Strategic Sealift Shortages and Shortfalls

● Initial Deployment Decisions and Priorities

Early in the crisis General Schwarzkopf, Commander-in-Chief, U.S. Central Command (USCINCCENT) made the deliberate decision to initially deploy combat and combat support units out of sequence with only austere organic combat service support (CSS).¹² The consequences of this decision were; to delay the initial deployment of logistics command and control elements and critically required port operations units,¹³ to stress a maturing host nation support (HNS) infrastructure, to necessitate the reprioritization and rescheduling of several Army units (notably the 3rd Armored Cavalry Regiment) which resulted in early arriving units having to rely on an ad-hoc support patchwork of organic supplies, HNS, and USMC Maritime Prepositioning Squadron supplies.¹⁴ The far ranging impact of this decision was that the Theater Army logistics structure did not mature until mid-November 1990. Not only were weaknesses in deployment planning identified but the inability of the Joint Operations Planning and Execution System (JOPES) to easily reschedule or "reflow" units within the Time Phased Force Deployment Data (TPFDD) and then to automatically generate airlift requirements and scheduling caused early deploying air and sealift assets to be malpositioned.¹⁵

The deployment phase provides three key lessons for the future. First, when developing Operations Plans (OPLAN) assumptions the initial mix of combat, combat support (CS) and combat service support (CSS) units must always be considered as

tentative and subject to radical revisions based on the actual situation and the commander's assessment. Plans for initial sustainment must be formulated accordingly. Second, reliance on the flexibility provided by prepositioned supplies either afloat or ashore must be considered as essential in future OPLAN development for regional conflicts and contingency operations.¹⁶ Third, in the case of ODS - we were simply fortunate. Not only did the Iraqi Army halt their advance at the Kuwait - Saudi Arabian border but Saudi Arabia possessed an in-place and easily expandable internal logistics infrastructure and host nation support capability. In future conflicts or contingencies we may not be as fortunate. Surely, the consequences of providing U.S. forces with unhindered access to safe and secure arrival airfields and seaports have not been lost on future potential adversaries. The requirement for the force projection U.S. Army of the future to have immediate and secure access to aerial and sea-ports of debarkation and to possess the capabilities to quickly connect into the host nation support infrastructure are, at once, future logistic imperatives and exploitable logistics vulnerabilities.

● Strategic Sealift Shortages and Shortfalls

"No nation in history has ever moved so much, so fast, so far."¹⁷

General Hansford Johnson
CINCTRANSCOM

"It is clear to all of us who were involved in the Gulf War, that the United States needs to augment its fast-sealift capability."¹⁸

Lieutenant General William Pagonis
CG, 22d SUPCOM

The initial ODS strategic deployment by air and sea of personnel, equipment and supplies was truly staggering and exceeded the initial deployments of World War II, the Korean War and the Vietnam War.¹⁹ During the deployment phase of ODS the 22d SUPCOM recorded the receipt of over 350K personnel, the offload of 523 ships and over 9,000 aircraft containing over 12,400 track vehicles, 114,000 wheel vehicles, 1,800 army helicopters, 33,000 containers, and 1.8M short tons (s/tons) of cargo and 300,000 s/tons of ammunition.²⁰ This amazing accomplishment was not without its share of implications for the future.

A critical deployment shortfall was the lack of rapid and responsive sealift.²¹ While the available eight Fast Sealift Ships (FSS) were heavily tasked and were ultimately invaluable, the activation of 76 ships in the Ready Reserve Fleet (RRF) highlighted the limitations of these over-aged vessels and the affects of years of under-funding and subsequent degradation of

their sea worthiness.²² Delivery of the RRF was generally delayed 11 to 16 days²³ and a full 25 percent of the RRF was delivered up to 10 days late.²⁴ Additionally, U.S. Transportation Command (TRANSCOM) chartered 152 commercial vessels to augment military sealift and by mid-February 1991 ODS sealift deliveries totalled over 3.5M s/tons.²⁵ However, an interesting perspective on the effectiveness of the RRF and commercial charter sealift is illustrated by the revealing fact that of the 523 vessels discharged, the eight FSS and the 25 prepositioning supply ships (which included twelve Army Prepositioning Ships (APS) and thirteen U.S. Marine Corps Near Term Prepositioning Ships (NTPS)) accounted for almost 2/3 of the total ODS sealift deliveries.²⁶ An additional worrisome indicator is that the November-December 1990 deployment of the VII Corps from Germany was accomplished primarily using NATO, European and even Warsaw Pact sealift since available military and U.S. commercial sealift was consumed with ODS deployment and sustainment operations.²⁷

The strategic deployment implications for future force logisticians are obvious. First, as the U.S. Army transitions from a forward presence Army to a power projection Army (with the Bottoms-Up Review (BUR) requirement of fighting and winning two nearly simultaneous major regional conflicts (MRCs)²⁸ and prepares for a variety of ill-defined contingencies and military operations other than war (MOOTW)), the need for continued strategic airlift modernization programs and for additional roll-on and roll-off (RORO) Fast Sealift Ships is essential.

At present, the requirement to move two heavy divisions worldwide within 30 days, has been identified and validated but a continued, unwavering commitment to funding, procuring and obtaining these vessels is required to resolve this serious deficiency.²⁹ Second, ODS emphatically validated the effectiveness of regionally prepositioned Army, Marine Corps, and Air Force CSS equipment, both afloat and ashore.³⁰ The advantages of reducing CONUS-based strategic lift requirements must be balanced against the initial procurement, maintenance costs and vulnerability to preemptive attacks. The poor performance of the RRF and over reliance on dwindling U.S. and non-U.S. flag commercial sealift makes it clear that prepositioning ground force equipment and initial supply stocks may solve a multitude of strategic deployability shortfalls and miscalculations while improving crisis response deployment times. Third, future forces must be organized and equipped to reduce strategic mobility and lift requirements. The imperative to evolve into a CONUS based force projection Army must drive a radical reassessment and restructuring of Army combat, CS and CSS units and the development of equipment that is increasingly lethal, mobile and sustainable while simultaneously reducing strategic lift requirements.

Operation Desert Storm (17 Jan - 15 March 91) - Preparation and conduct of ground offensive operations

Throughout the autumn of 1990 the build-up of U.S. and coalition forces continued while the air campaign progressively weakened and blinded the Iraqi Armed forces. By the end of October 1990 the 22d Support Command which had begun with only LTG Pagonis and four logisticians had grown to 2,973 personnel with fifty-three units³¹ and was responsible for supporting the 97K soldiers of the XVIII Airborne Corps.³² When the 22d SUPCOM (Provisional) was officially activated on 8 August 1990 their stated mission was to:

- Deploy and organize HNS to receive and onward move of soldiers and marines entering the theater.
- Provide for further development of the U.S./Saudi Arabia (SA) Host Nation infrastructure.
- Develop from zero base the ARCENT SUPCOM using arriving U.S. units and cadre with host nation elements. Mature to a combined U.S./SA Support structure.
- Provide theater-wide logistics support for the reception, onward movement and sustainment of U.S. and combined forces.³³

However, in early November 1990 the Theater Army support dynamics changed dramatically with President Bush's decision to deploy an additional U.S. Army Corps (VII Corps) from Germany to support ground offensive operations to liberate Kuwait. This development placed additional strains on an already stressed logistics structure and by mid January 1991 the 22d SUPCOM had received and was supporting over 221,000 soldiers, over 6000 tracked vehicles and 59,000 wheeled vehicles with approximately 80% of the VII Corps having arrived in the theater.³⁴

By mid January 1991, the 22d SUPCOM had grown to 23,794 personnel and was focusing on the upcoming ground offensive sustainment planning and operations.³⁵ With deployment reception operations nearly completed, full attentions were directed towards preparation for supporting the ground offensive by repositioning and building forward supply stocks, preparing forward logistics bases and with supporting the simultaneous repositioning of the U.S. Army Corps into attack positions.

As with Operation Desert Shield, logistics operations during Operation Desert Storm provided a host of pertinent insights. The following issues have particular relevance concerning future battle logistics and sustainment operations:

- Host nation support and coalition responsibility sharing
- Support of High Tempo Mechanized Operations
- Centralized Management, Planning and Control of Theater Army Logistics

● Host Nation Support and Coalition Responsibility Sharing

While one of the greatest accomplishments of ODS was the building of the ODS allied coalition, the pervasive extent to which the U.S. Army was logistically dependent on coalition contributions and Saudi Arabian host nation support is not well known or understood.³⁶ At the peak of ODS, Saudi Arabia provided U.S. Army units (on a daily basis) with over 1.5M gallons of petroleum,³⁷ 210K Host Nation "A" meals,³⁸ 1.1M cases of bottled water, and over 3M gallons of bulk potable water.³⁹ Other Saudi Arabian HNS included; over 4000 vehicles (including 655 heavy equipment transporters (HETS), 275 POL tankers, 1286 flatbeds and 437 lowboy trailers) and over \$1.9B in leased billets and storage facilities.⁴⁰ In addition to unrestricted access to and use of modern aerial and sea port facilities, Saudi Arabia provided in-kind host nation support totalling over \$13.5B in cash.⁴¹ Other coalition contributions included; the UAE provided \$3B, Kuwait paid \$13.5B, Japan provided \$8.332B in cash and almost \$550M in equipment and supplies, Germany provided \$5.5B in cash and over \$550M in NBC detection vehicles and other equipment, and South Korea committed \$275M in cash and in-kind materiel and lift.⁴²

The picture that emerges is complex and rich with implications for future logistics planners. ODS explodes the myth that the U.S. Armed Forces possesses the capability to conduct multiple Corps level future unilateral military actions in major regional conflicts (MRCs). Not only did Saudi Arabia

provide most of the coalition's, fuel, water and facilities but coalition contributions of truck transportation assets, supplies, equipment and strategic air and sealift and cash totalled over \$54B of the \$61B ODS costs.⁴³ We could not have supported ODS without the willing consent and contributions of the coalition nations as is clearly illustrated in the following quotation from Mazar, Snider and Blackwell's, Desert Storm:

"The lesson is clear: The United States was dependent on allies before, during, and after this war, and there is almost no prospect of being less dependent in any major future war. The implication is that joint planning and training with our allies during peacetime, in bilateral or multi-lateral forums, is more important than ever. Peacetime agreement, plans and exercises lay the critical foundations on which effective deployments and campaigns are built."⁴⁴

● Support of High Tempo Operations

"Logistics units were hard-pressed to keep up with the rapid pace of maneuver units. Both logistics structure and doctrine were found wanting in the high tempo offensive operation...Had the operation lasted longer, maneuver forces would have outran their fuel and other support."⁴⁵

Conduct of the Persian War
OSD Final Report to Congress, April 1992

Operation Desert Storm highlighted weaknesses and shortages in U.S. Army CSS force structures, tactical vehicle mobility and materiel handling equipment requirements. No single event better encapsulates these problems than the operation to reposition two U.S. Army Corps prior to the commencement of the ground offensive.

The movement to reposition the VII and the XVIII U.S. Army Corps conducted prior to the start of the ground offensive began on 17 January 1991 and was completed in only 21 days. This amazing accomplishment included the establishment of nine logistical support bases, the movement and crossing of two corps with five days of supplies and created a vehicle density on the only two main supply route (MSR's) that, at any point, eighteen vehicles would pass each minute every 24 hours a day.⁴⁶ The movement required over 1300 heavy equipment transporters (HETS), 450 lowboys and 2,200 flatbed trailers totalling almost 4,000 heavy trucks. However, of the over 4000 vehicles only 1,400 were organic to U.S. Army units.⁴⁷ The shortage of transportation assets, resolved by a mix of military and commercial U.S./coalition assets, clearly illustrates the critical imbalance that has occurred in the CSS capabilities to support mechanized operations in fast paced, high tempo operations.

ODS serves as a wake up call that in the future the lack of motor transport capability and vehicle off road mobility must be resolved. In order for future ground force commanders to fully leverage the combat power of rapid and high velocity, mechanized operations, the supporting CSS units must be able to maintain the same operational pace and momentum. During ODS, improvisation, dogged efforts and coalition donations overcame many of these organizational shortfalls. However, for the long term, the operational deficiencies in transportation vehicles, off road mobility, materiel handling equipment and manning levels in CSS units begs further study, definition and resolution.

Theater Army Logistics Planning and Operations: Centralized vs Decentralized Control and Management

"Contrary to some fanciful media reports,... the 22d SUPCOM was not a band of logistical outlaws."⁴⁸

LTG William G. Pagonis
Moving Mountains

"I think our experience demonstrated the clear advantages inherent in having a single point of contact for all resource management and contracting, especially in host nation where certain resources are limited."⁴⁹

LTG William G. Pagonis
Moving Mountains

In his 1992 book on Persian Gulf War logistics, LTG William G. Pagonis presents a compelling argument for a fundamental doctrinal shift in the Army's approach towards centralized management and control of logistics at the Theater Army level. Briefly, he maintains that control of theater logistics resources should be centrally planned and controlled by a single "point of contact."⁵⁰ The advantages of this centralized management include; visibility and control over a theater's critically limited resources (especially HNS and transportation assets--both strategic and theater), reduction of the layering of competing logistics headquarters within the theater, and the capability to effectively prioritize and allocate supplies being requisitioned and sent from CONUS.⁵¹ Improved Theater Army materiel management capabilities resulting from Total Asset Visibility (TAV) initiatives and from improvements in data transfer technologies will provide future logisticians with the ability to more closely

screen and prioritize requisitions to significantly reduce the movement of unneeded stocks that tied up scarce strategic airlift, sealift and theater ground transportation assets during ODS.

As technologies improve and make in-transit and inventory visibility a reality and as the U.S. Army devolves into a force projection Army - a more centralized logistics planning and resource management doctrine will offer many advantages and will be especially applicability in future force projection contingency operations in logistically austere theaters.

Future-Battle Logistics in the Twenty First Century

"We are in a period of great transition. The changes experienced in the few years following the end of the Cold War will likely continue. In their wake will follow crises, conflict and war. In the early twenty-first century, the United States will face challenges of unprecedented complexity, diversity, and scope."⁵²

TRADOC Pam 525-5
1 August 1994

"The future Army-Force XXI must be prepared to face the full spectrum of operational environments,....Therefore, our Army must design organizations and develop capabilities that will allow it to be rapidly tailorable, rapidly expandable, strategically deployable and effectively employable as part of a joint and multinational team to achieve results in future war and OOTW in all operational environments. Force XXI, must exploit reserve component capabilities, especially in strategic mobility, sustainment at all levels and early entry."⁵³

TRADOC Pam 525-5
1 August 1994

"The Future Ain't what it used to be."⁵⁴

Yogi Bera
Attributed

TRADOC Pamphlets 525-5, Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty First Century and 525-200-6, Combat Service Support: U.S. Army Battle Dynamic Concept, provide fairly comprehensive outlines for future threats, doctrinal imperatives and required combat and CSS capabilities for the U.S. Army of the 21st Century.

They predict future operational environments that range from General War through Major and Lesser Regional Contingencies to Operations Other Than War(OOTW).⁵⁵ While General War (with its emphasis on strategic offense and defense, major theater campaigns and general mobilization of the nation's resources) is considered less likely, the operational environments most likely to be encountered by the U.S. Army of the early 21st Century will be Major Regional Contingencies (Desert Shield/Storm), Lesser Regional Contingencies (Operations Urgent Fury (Grenada) and Just Cause (Panama)) and OOTW which include a wide variety of military operations including; peace operations, noncombatant evacuation operations, anti and counter-terrorism, counterinsurgency, civil support, domestic and international disaster relief, arms control and environmental operations.⁵⁶

The nature of future enemies and their armies will also profoundly impact on the development of the future U.S. Army. The two models that best capture the characteristics of future enemy armies and the nature of future warfare are found in TRADOC Pamphlet 525-5, Force XXI Operations, and in Alvin and Heidi Toffler's, War and Anti-War: Survival at the Dawn of the 21st Century.

TRADOC Pamphlet 525-5 characterizes future enemy threats as ranging from non-national to information-based, complex and adaptive armies. The full spectrum of future force threats are listed below:

Non-national (insurgents, organized crime, terrorists,
regional & ethnical religious groups)
Internal Security Forces
Infantry-Based Armies
Armor-Mechanized-Based Armies
Complex, Adaptive Armies⁵⁷

The Toffler's describe future force threats and warfare from an historical, economic and cultural context, but capture, essentially, the same range of future threats. In their model, future armies and warfare are described as being either First, Second, or Third Wave.⁵⁸ Generally, First Wave armies were agrarian in nature that date from antiquity to the modern industrial revolution of the early 1600's. First Wave wars were fought essentially between agrarian societies, and were limited in scope and objectives.⁵⁹ Logistics support for these armies was generally accomplished by foraging and by using pre-established stores or magazines.

Second Wave war is characterized as industrial-aged (1600's to the present) and based upon the social, economic and cultural factors of production in the modern-industrial nation state. Since Second Wave war involved the fate of the collective nation, the resources of the entire nation-state were committed. This shifted the scope, objectives and nature of war from limited wars to the "total" or "absolute" wars seen during the Napoleonic period, World War I and World War II.⁶⁰ Logistics support of Second Wave armies reflected these changes and increasingly freed armies from foraging (with its seasonal limitations) to systems of continual supplies and reliance on the industrial and agrarian capacity of the nation. Also, as the technologies of mass

production, interchangeable parts, industrial standardization, and the steam and internal combustion engines radically changed the conduct and support of modern armies, this further contributed to the rise of an industrial-style "total" warfare.⁶¹

The final warform, or Third Wave warfare, began evolving in the late 1970's and early 1980's and is still in progress today.⁶² In describing Third Wave warfare, the Toffler's model again links the interrelationships of a nation's economic system and means of production with its capacity to wage war. While a Second Wave nation relies on its industrial factors of production for waging war, a Third Wave army leverages knowledge and information based technologies as the primary sources of economic and military strengths.

If Third Wave warfare and armies represent the nature of future-war, then ODS offers several revealing insights. When Iraq is classified as a "Toffler Second Wave army" or as a TRADOC Pamphlet 525-5, Armor-Mechanized Based army and the U.S. Army is characterized as an emerging Third Wave army or Complex Adaptive army, then the resulting allied ODS victory (to include how ODS was fought and supported) become highly instructive. ODS illustrated that truly decisive advantages can be realized when an information-based force wages war against a Second Wave army. As the Tofflers state, "What is not clearly understood even now is the United States and its allies simultaneously fought two very different wars against Saddam Hussein. More accurately it applied two different war-forms, one Second Wave, the other Third Wave."⁶³

The implications concerning future warfare and armies are clear. The U.S. Army of the future must not only be prepared for military operations ranging from General War through OOTW but must also be structured to fight and logistically support forces engaged in both Second Wave and Third Wave (Complex-Adaptive Armies) military operations, simultaneously. This is indeed an imposing mandate.

When these various future-force concepts are synthesized, the U.S. Army of the early 21st Century will be a predominantly CONUS based force projection army that is organized and equipped to be flexible, tailorable and expansible, strategically deployable and effectively employable across the spectrum of future-battle environments.⁶⁴ Additionally, the U.S. Army of the future will be further defined by the following five operational characteristics listed in TRADOC Pamphlet 525-5:

- Doctrinal Flexibility
- Strategic Mobility
- Tailorability and Modularity
- Joint, Multinational and Interagency Connectivity
- Versatility in War and OOTW⁶⁵

When these various lists of Force XXI characteristics and imperatives are combined with the Operational Battle Dynamics of Battle Command, Battlespace, Depth and Simultaneous Attack, Early Entry and Combat Service Support then the nature of the future Army becomes even more focused.⁶⁶

Using the above future force characteristics and ODS logistics lessons learned, the following list of future-force CSS logistics imperatives is proposed:

- Improved strategic mobility and unit deployability.
- Enhanced force sustainability through improved automation, data transfer communications, total asset visibility (TAV) and greater reliance on currently available and future technologies (such as automated identification technologies, imbedded unit identification and location devices, and digitalization of the battlefield).⁶⁷
- Reliance on a flexible and adaptive CSS doctrine at the strategic, operational and tactical levels of logistics.
- Enhanced CSS equipment capabilities to improve CSS unit productivity, vehicular mobility, and maintenance supportability. (MHE, ground transportation assets and self diagnostic systems).
- Greater reliance on prepositioned equipment and supplies afloat and ashore.
- Split-Based Operations at all levels of logistics operations - strategic to tactical.⁶⁸
- Continued maintenance of a sufficient, flexible and viable industrial base with the identification and stockpiling of critical long-lead time production components and items.⁶⁹

- Continued development of doctrine, tactics, technologies, and procedures to facilitate joint, combined and interagency logistic support operations in multinational alliances and coalitions.

Future - Force Logistics Recommendations

The more I see of war, the more I realize how it all depends on administration and transportation....It takes little skill or imagination to see where you would like your Army to be and when. It takes much more knowledge and hard work to know where you can place your forces and whether you can maintain them there. A real knowledge of supply and movement factors must be the basis of every leader's plan; only then can he know how and when to take risks with those factors, and battles are won only by taking risks.⁷⁰

ACP Wavell
Speaking Generally, 1946

"Forget logistics and use you lose."⁷¹

LTG Frederick Franks
CG VII Corps

While researching this paper, I was struck by two inescapable conclusions. First, concerning ODS, the extensive study of after action reports and official lessons learned tends to lead to the impression that the logistics operations during ODS were plagued by malignant and systemic logistics problems. This was simply not the case. Overall, logistics operations during ODS were exceptionally well planned and executed. Great credit is due to the many U.S. Army logisticians of all ranks whose ingenuity, commitment to their professions and dogged

dedication to their missions ultimately ensured victory over the Iraqi Army. Second, in studying future force and doctrinal thoughts and concepts it is easy to be swept away by the alluring jargon and comfortable simplicity of "future-speak." When proposing future U.S. Army logistics doctrine, organization and equipment, it is critical to remember that regardless of the future-war models, the fundamental mission of military logistics will not change. The support and sustainment of armies in future wars will continue to be accomplished in the terrible crucible of battle with all the frictions, attending fears, deprivations and constraints that only war provides. With this sobering preface, the following recommendations for the development of future U.S. Army logistics doctrine, organizations/force structure and materiel/equipment in the 21st Century are offered.

Future Doctrine

Since doctrine is a major driver of future change in the U.S. Army, logistics doctrinal changes should be evolutionary and not revolutionary. This note of caution stems from a nagging suspicion that if the U.S. Army commits to a future doctrine that cannot be sufficiently funded or relies on technologies that cannot be obtained--then it will be doomed to failure. Consequently, future CSS doctrine must be based on the fundamental premise that it must be both effective in supporting the Army of the 21st Century and feasible.

Future CSS doctrine must continue to emphasize flexibility and adaptiveness. As future technologies provide increased management capabilities and asset visibility, greater centralized control of CSS planning and operations will become possible and desirable. As discussed, centralization of Theater Army CSS control and management supports the envisioned increased operation and support tempos. A single logistics manager in the Theater exercising asset visibility over theater supplies, transport and HNS should be the objective and the standard. This should lead to a more accountable, responsive and proactive system of assured logistics. This concept is equally applicable in mature theaters (Europe and Asia) and immature theaters (SW Asia) and is particularly adaptable to contingency operations as well as MOOTW.

Having raised the issue of CSS operations across the operational spectrum it must be emphatically stated that future CSS units must be manned, organized, trained, and equipped to conduct successful logistic sustainment operations in high tempo, mechanized theater-level regional conflicts fought in nuclear and chemical threat environments. The standard of success in the early 21st Century must remain rapid strategic deployment, immediate establishment of the logistics support and sustainment infrastructure and the continuous sustainment of combat mechanized operations in two nearly simultaneous major regional conflicts. To adapt a lesser standard ignores the lessons of history and the perils of the future.

This imperative impacts on several issues. First, the U.S. Army active component (AC) and reserve component (RC) mix of CSS force structure must be carefully reviewed not only in light of the ODS seven month build-up period, but more importantly the implications of imbedding approximately 70% of the Army's CSS force structure in the RC at a time when the Army is devolving from a forward presence to a force-projection Army.⁷² As LTG Pagonis suggests, serious considerations must be given to forming mixed AC and RC CSS headquarters and units that are capable of rapid deployment with little or no train-up period.⁷³ This tends to favor greater, not lesser, AC CSS headquarters and force structure. Second, if the nature of future battle is evolving as ODS suggests, to the application of massive, synchronized, and overwhelming artillery and air firepower then the implications on future CSS doctrine must be closely examined. Exactly how emerging future artillery doctrines will impact ammunition requirements and doctrine is still uncertain. The immediate answer would suggest that the use of large concentrated artillery fires in an increasingly empty battle-space will increase ammunition requirements, transport, MHE and attendant ammunition handlers. However, as artillery munitions become increasing smart and even brilliant-the message is uncertain. What is clear is that during ODS excessive conventional artillery munitions were requisitioned, shipped, and not used. In future conflicts the requirements for specialized artillery munitions such as

Multiple Launch Rocket System (MLRs) and other long lead time production munitions will increase.⁷⁴ The implications must be accurately assessed, projected and incorporated into future CSS doctrine.

Future CSS Organizations

If effective future CSS doctrine is to become an operational reality then the key will be redesigned CSS organizations and force structures - from the strategic through the tactical levels of logistics. The CSS organizations of the future must possess the following qualities and characteristics. They must: be modular in function and design, be sufficiently robust and capable of conducting split operations, be designed and equipped to accomplish CSS missions across the wide range operations in both nuclear and chemical environments and be designed for greater connectivity with joint, combined, coalition, HNS and commercially contracted CSS architectures and systems.

The modular CSS units of the future should be standardized by function, manning and equipment in order to facilitate seamless task organizing, and force tailoring. The basic unit of this concept would be the functionally aligned company in a multifunctional support battalion attached to Brigade level task forces. Functional companies (i.e., supply and service, maintenance, medical, transportation, finance and personnel) capable of being subdivided into easily detachable platoons and detachments will serve as the building blocks upon which support

battalions (supporting either divisional or corps units) are built. As envisioned almost identically sized and configured CSS forward support battalions will be attached to either divisional or corps maneuver brigades task forces or brigade sized units. These multi-functional support battalions should, in turn, be sized and nearly standardized army-wide. If additional functional logistics capability is required then a platoon, detachment, company or even (multi-functional) support battalion would be placed under the operational control of the gaining battalion, group or brigade on a mission basis.

CSS command and control headquarters should also be standardized at the battalion, group or brigade levels. Materiel management functions would remain escheloned at the Division, Corps and Theater Support Commands levels. The Division Support Command (DISCOMs) should remain but evolve primarily into logistics planning and command and control (C²) headquarters responsible for materiel and resource management and for exercising command and control over attached support battalions. Direct support missions currently performed by the divisional Main Support Battalions MSB such as field services, back-up maintenance support, mortuary affairs, and motor transport would be obtained from the Corps Support Groups or Brigades on a mission basis. The key to this concept is that for both AC and RC units, CSS organizations to include platoons, detachments, companies and battalions would be standardized with the

capability to be easily attached or detached from existing support battalions as required.

The second characteristic of future CSS organizations, must be the capability to conduct split-based operations. As envisioned in TRADOC Pamphlet 525-200-6, Combat Service Support: U.S. Army Battle Dynamic Concept, split-based operations are an objective capability that will rely on vastly improved data transfer and digital technologies to, "allow routine management functions to be accomplished in CONUS while critical wartime functions can be projected forward early in an operation."⁷⁵ While an example of a Corps Materiel Management Center split-based operations is cited, it is not a far stretch to envision split-based technologies and capabilities being employed down to the support battalion/company level for resupply requisitions, personnel reporting and status and reporting. Another less obvious aspect of split-based operations is to expand split-based operations to split-location operations at the tactical unit level. CSS support battalions must be configured with the required manning and equipment to control and conduct CSS operations from two distinct locations on a continual 24 hours basis in support of rapidly moving operations. When implemented, split-based and split-locations operations will revolutionize tactical level, operational and strategic CSS planning and operations.

ODS and subsequent operations in Somalia and Haiti have demonstrated the utility and argument for the expanded use of

commercial contractors to provide many of the supplies, sustainment and services normally provided exclusively by military logistics units. The reliance on an expanded use of commercially contracted CSS is certainly a two-edged sword. However, it offers great potential for cost savings and CSS force preservation of limited theater CSS force structure. Additionally, expanded use of commercial contractors will provide the future logistician with immediate responsiveness and a considerable range of capabilities without implications of activating RC soldiers or employing AC CSS forces.

Future CSS Materiel and Equipment

Future-force CSS materiel requirements and recommendations fall primarily into five broad categories: improved strategic sealift and airlift; improved and increased CSS transportation and MHE assets (transportability and mobility); improved automation, communications and data transfer capabilities and identification procurement and stockpiling of critical War Reserve Stockage of long leadtime components (LLC) and items (LLI).

While considerable attention is naturally paid to the development and procurement of strategic airlift programs (the C-17 for example), lesser is provided to current and future sealift programs. It is essential in the near term that current sealift improvement programs be adequately funded to ensure that

the U.S. retains preeminence in strategic deployment into the 21st Century. During ODS over 90% of the Army supplies and equipment were sent by ships which accounted for 523 ship loads of over 26.9 million square feet of cargo space delivering over 2.11 million s/tons of supplies and equipment.⁷⁶ These impressive totals serve as a vivid warning that even in spite of the almost \$7B that had been spent during the 1980's to improve sealift capabilities, that during ODS there were insufficient large RO/RO ships to adequately support the deployment and that the RRF was less than adequate.⁷⁷

Concerning CSS equipment shortages and shortfalls, the 22d SUPCOM After Action Report states succinctly that, "a large theater and an offensive scenario requires more transportation equipment than currently available (MHE/HETS/POL/S&P/LOWBOY)."⁷⁸ Concerning off road mobility the After Action Report further stated that, "Enhanced off road capability of transportation assets is necessary."⁷⁹ Both deficiencies were overcome by a combination of ingenuity, HNS (vehicles and drivers) and coalition equipment donations. However, additional transportation and MHE assets are required in both AC and RC units and the off-road mobility issue must be resolved through improved equipment design and modernization programs. Again, the funding of truck and MHE modernization programs may not be particularly exciting but is vital to future success in logistics operations requiring high tempo, offensive mechanized operations.

The final materiel recommendation concerns the future of the U.S. defense industrial base. ODS provided an extremely valid test of the U.S. industrial base's capability to surge or accelerate production of critically needed items and components in time of war. Many problems concerning shortages of long leadtime components (LLC) and long leadtime items (LLI) for such items as, Patriot PAC 2 missiles, chemical defense equipment, clothing, food (T-Rations), certain munitions (25mm), maintenance and chemical protective shelters, water chillers and Reverse Osmosis Water Purification Units (ROWPUS) were identified.⁸⁰ While it is true that the industrial base surged to meet ODS demand, problems with LLC and LLI materiels were resolved primarily as the result of the six months preparation time before ground offensive operations began. The lesson is clear. Not only must LLCs and LLIs be aggressively identified, procured and stockpiled for future contingencies but the entire issue of the adequacy of the industrial base to support reconstitution of critical major end items is a question that must be continually assessed and reviewed.

Conclusions-The Challenge of Change

"To prepare for war in time of peace is impractical to commercial representative nations, because the people in general will not give sufficient heed to military necessities, or to international problems to feel the pressures which induces readiness."⁸¹

A.T. Mahan

"Writing on war in the future in these fast moving times is like describing a game in which the goal posts are moved every day and the rules changed every night....It is highly unlikely that we will be in a situation that bears much similarity to the present, and almost anyones guess can be as good as the next persons."⁸²

Julian Thompson
The Lifeblood of War

In the final analysis, the challenges of change will be accomplished by a combination of cautious hindsight, visionary foresight and determined convictions. The required changes that will transform the U.S. Army will not be driven simply by visionary concepts but must be rooted in and tempered by the lessons of the past. In this respect ODS provides a tantalizing hint of the future while serving to provide a foundation upon which to build. Changes to current CSS doctrine should be evolutionary to ensure that the resulting future CSS doctrine, organizations and materiel are mission effective and fiscally attainable. How we meet this challenge of change will be the legacy we leave to the U.S. Army and to the logisticians of the 21st Century.

Endnotes

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