

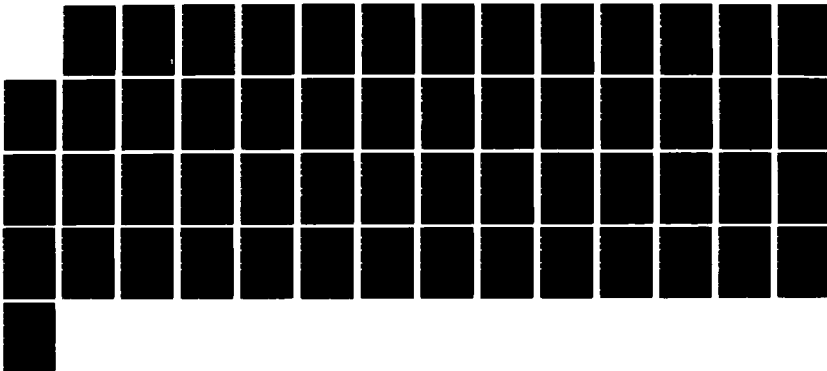
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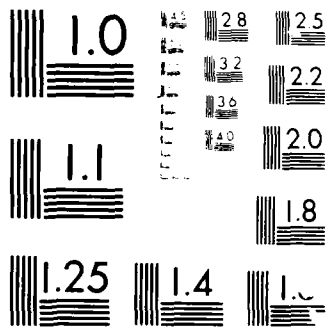
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Tactical Lift: The Flexibility Shortfall in AirLand Operations

by

Major Robert T. Dail
Transportation Corps

School of Advanced Military Studies
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas

4 March 1988

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Name of Student: Major Robert T. Dail
Title of Monograph: Tactical Lift: The Flexibility Shortfall in
AirLand Operations

Approved by:

James R. McDonough Monograph Director
Lieutenant Colonel James R. McDonough, M.S.

L. D. Holder Director, School of
Colonel L. D. Holder, M.A. Advanced Military Studies

Philip J. Brookes Director, Graduate
Philip J. Brookes, Ph.D. Degree Programs

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ABSTRACT

TACTICAL LIFT: THE FLEXIBILITY SHORTFALL IN AIRLAND OPERATIONS.
by Major Robert T. Dail, USA, 48 pages.

This monograph explores the capability of army tactical headquarters to fight and sustain combat brigades and task forces simultaneously. Its focus is on the tactical transportation shortfall which exists in the army today, the impact of this shortfall on AirLand Battle doctrine, and some recommended solutions.

Historical examples from twentieth century war are used to demonstrate the importance of transportation in providing flexibility at the tactical level. Specifically, military motor transportation has repeatedly provided a degree of certainty and flexibility to combat operations since the advent of the automobile on the battlefields of France in World War I. The paper questions whether current tactical headquarters possess the same degree of flexibility by defining a present day tactical transportation shortfall. This shortfall was determined from a review of current army organizational documents, planning factors, consumption rates, recently compiled lessons learned by the Combined Arms Training Activity at Fort Leavenworth, and interviews of former key tactical-level leaders. The paper argues that interdiction, competition, and friction will magnify current tactical lift shortfalls in future wars to a level where host nation support and scavenging will be unable to resolve them.

The author concludes that while host nation support and scavenging may be appropriate means for supporting U.S. forces at the operational and strategic levels of war, they do not provide the certainty or flexibility required by tactical level headquarters to fight and win on the next battlefield. The authorization of additional military trucks and drivers is recommended at the task force or brigade level to correct the current shortfall.

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I. INTRODUCTION

The first essential condition for an enemy to be able to stand the strain of battle is an adequate stock of weapons, petrol, and ammunition.

Field Marshal Erwin Rommel(1)

During the past decade the United States Army has created more combat muscle in its force structure to fight the AirLand Battle by eliminating combat service support positions in Tables of Organization and Equipment (TOE's), and replacing them with positions which call for combat arms personnel. This initiative has served two purposes. It has helped generate enough savings to resource additional combat force structure, and it has provided the army with a much needed emphasis on combat and fighting.

Many of the reductions in the combat service support structure have been based upon productivity analysis studies by the Department of the Army. These studies, designed to identify areas where savings in manpower could be achieved, were praised by General Richard N. Thompson, formerly Deputy Chief of Staff, Logistics, United States Army. General Thompson saw these studies as a means for the army to continue to look for more efficient ways to support front line soldiers. Demonstrating the enormity of the resource savings achievable through productivity analysis General Thompson, on one occasion, observed ". . . that three pipeline companies could replace nine truck companies."(2) Attitudes like this have set a trend in our army.

In 1984, Army Logistician summarized the comments of Secretary of the Army John O. Marsh, Jr. and former Army Chief of Staff General John A. Wickham regarding the logistics posture of the United States Army. The following passage from this summary illustrates the impact of force structure initiatives and productivity analyses on army logistics units.

The army is looking at . . . expanded host nation support, increased support from other services, commercial activities, and the commercial augmentation program (LOGCAP) . . . The Army is short active force support units currently needed at the onset of hostilities to support a global scenario . . . Forward deployed and reinforcing forces rely heavily on host nation support forces for . . . sustainment.(3)

U.S. Army initiatives of the past decade have caused its logisticians to focus on the concerns Rommel spoke of in World War II. By stockpiling and prepositioning materiel, however, the army may be demonstrating that it did not learn the correct lessons from history. Ever since World War I, the United States has been able to produce large quantities of materiel for war quickly and efficiently.(4) The problem for Americans has seldom been whether the nation could provide enough supplies, equipment, and manpower for war, but rather, whether it could deliver them to the decisive place at the decisive time to affect victory. The building of large stocks at theater supply bases has long been the "American way of war." However, in an era in which the army has moved to reduced manpower strengths in combat service support branches, increased emphasis has been placed upon technology, host nation support, and the development of "push

package" sets of supplies and equipment. These "push packages" are sets of prepackaged supplies configured in unit bundles based upon missions, numbers of soldiers, and environment. To maintain these large stocks of prepackaged supplies, the modern day logistician employs automation to provide up to date inventory, requisition, and supply status.(5)

There is a seductive danger in all of this, however. Victory has not, and will not, ever be achieved merely by acquiring and stocking supplies in preparation for war. History reminds us that victory will not be achieved unless supplies are delivered to those engaged in battle -- on time. In his article, entitled "The VII Corps Commander Views Grass Roots Logistics," General John Galvin mentions many developments aimed at solving tactical level logistics problems. However, transportation at the corps level and below is never mentioned as a concern. Nor is it an area where he believes new assets will be integrated into the support systems of tactical units.(6) Tactical lift is treated as though it were sufficiently available.

This disregard of the significance of tactical transportation is alarming since it is transportation which provides our army with a major portion of its flexibility. When we read General Thompson's comment concerning the savings which three pipeline units provide the army we should ask, "But how much of class I, II, IV, V, VII, and IX can these pipeline units move?" Or more importantly, we might ask, "And who moves the fuel when the pipeline is interdicted?" Military professionals

should be on guard to ensure that analysis studies and stockpiling theories do not reduce our flexibility in their quest for efficiency.

An entire monograph could well be devoted to the analysis of the United States' capability to transport war stocks at each level of war -- strategic, operational, and tactical. The problems and challenges involved with port rehabilitation, port management, railway repair, landing craft procurement, beachmaster operations, and strategic sea and airlift are well documented in military history. Our nation devotes a great amount of its energy toward refining its capability to provide strategic and operational mobility in time of war. This monograph, however, seeks to explore the capability of army tactical headquarters to sustain and fight combat brigades simultaneously in AirLand operations. Its focus is on the tactical transportation shortfall which exists in our army today, the impact of this shortfall on AirLand Battle doctrine, and some recommended solutions.

II. HISTORICAL PERSPECTIVE

It is appropriate to start with a review of what history has taught us regarding transportation at the tactical level of war. This review will focus on the causes, effects, resolutions (if any) of tactical lift shortfalls in three historical scenarios. The first of these examples is the United States Army operations in the Meuse-Argonne during World War I. The second example is

Rommel's Afrika Korps operations during 1941. The third is the logistics support of the VII U.S. Corps in Europe during 1945.

III. THE U.S. ARMY IN THE MEUSE-ARGONNE

In reviewing the U.S. Army's participation in the Meuse-Argonne offensive, it is important to understand the nation's logistics situation in 1918. As the U.S. Army began planning for battle the logistics base in France had begun to build through strategic mobility, local requisition, and host nation support. Even though the French had entered their fifth year of war supplies still could be assembled by the allies in significant stockpiles. As they prepared for war, however, the Americans quickly realized that transportation of supplies, and not the supplies themselves, would be the key for success. Specifically, the Meuse-Argonne offensive highlighted the emergence of motor transportation as a significant factor in American war -- the responsive link between the nation's arsenal of weapons, ammunition and materiel and the front line soldier.(7)

General Pershing, in his role as Commander of the American Expeditionary Force, would learn firsthand the importance of tactical motor transport before the Meuse-Argonne was finished. Many men would suffer because of America's inability to move supplies forward to her front line troops. Delivering supplies to units on the battlefield was, aside from the actual fighting, the most difficult aspect of the Meuse-Argonne operation.(8) The thousands of trucks and animals in use were but a fraction of

what was thought to be needed by senior staff officers. To ensure that his men received critically needed items, Pershing directly intervened and stripped the Services of Supply (the organization which was responsible for moving supplies from the seaports in France to the units on the battlefield) of its trucks, thereby crippling operations at the ports and construction projects.(9) Motor transport had become so important to the American staff that John A. Huston writes in the Sinews of War, ". . . it was the truck and the key role it played which, more than any other single thing, characterized battlefield logistics of World War I."(10)

Pershing had no alternative but to allocate motor transportation assets to the front in order to break open the existing stalemate in France successfully and force a return to maneuver warfare. He had to create a breakthrough with an attack. To mass quickly for such an attack required tactical transportation. Everything that could be imagined was tried to achieve mobility, from laying miniature railroads behind friendly lines to the use of buses from major French cities to assemble participating divisions. These actions released trucks for use at the front where they were consumed at an alarming rate. As Huston adds,

If men at the front sometimes went hungry, if ammunition sometimes went low, if evacuation of the wounded sometimes was less than satisfactory, it more than likely was not the result of any general shortage of supplies in the area or even of transportation, but the result of enemy action and the inherent difficulties of

getting supplies forward and casualties rearward during intensive combat.(11)

The Meuse-Argonne offensive required much more tactical transportation assets than ever before because modern weaponry had proven that it could interdict and destroy it in significantly larger numbers. Motor transportation, both commercial and military, had to be available in greater quantity, not larger size, to achieve flexibility. Due to insufficient transportation assets with which to supply the front, exacerbated by the heavy maintenance and combat interdiction attrition, Huston doubts whether a few more weeks of extensive fighting could have been sustained after the Meuse-Argonne.(12)

Unfortunately, the lessons learned from the Meuse-Argonne regarding tactical transportation did not receive wide attention in America's study of military science after the war. The war simply did not last long enough to highlight its significance. The Armistice was signed shortly after the Meuse-Argonne, and the nation quickly brought the troops home to demobilize. Even though Henry Ford would provide transportation to the average American with his low-cost Ford automobiles in the 1920's, and although many officers had experienced the consequences of not having adequate motor transportation in World War I, the obvious centrality of motorized transport would be lost by the interwar planners. Many officers who fought in World War I still regarded the horse as a significant participant on the next battlefield. Still others lobbied for new weapons such as the tank and the airplane, which provided for their own mobility, and disregarded

the need for independent supply transportation. Guderian in the German army and Patton and Mitchell in the American army were officers who advocated high technology acquisition and revolutionary doctrine, items which eventually captured the necessary funding while less sophisticated and durable items, struggling for visibility, went unpurchased.(13)

IV. ROMMEL'S AFRIKA KORPS - 1942

Rommel is a revered name to many modern maneuver commanders. To them he is the "Desert Fox", the fierce competitor, the commander who led from the front. Considering his reputation, it is not surprising that he continues to influence officers of today. While many historians point to the quote which heads this paper as a hint to the cause of Rommel's defeat in North Africa, there has been great debate about the adequacy of Rommel's support by the German High Command. It is a popular belief that Rommel was not supported well by his government. But a closer review of the circumstances surrounding Rommel's campaign will demonstrate that tactical level logistics shortfalls contributed more to his defeat than did strategic and operational difficulties.(14)

The conditions in which Rommel's Afrika Korps operated were extremely difficult, to say the least. Both sides, German and British, faced the same circumstances regarding supply and local conditions. There were far fewer civilians to support them in Africa than in Europe. The terrain, although equally hostile to

both sides, was not the major consideration in winning and losing. The transportation of supplies was the key to winning in the desert. Everything to sustain life and war had to be brought in from the outside by the countries involved in the fight.(15) As James L. Stokesbury stated, ". . .depending upon whose supplies were coming into the battle area more frequently, the war swung back and forth across Cyrenecia like a pendulum."(16)

Much activity was generated in Berlin and in Rome during the Fall of 1941 and Spring of 1942 in an effort to push supplies and equipment to Rommel's forces in Africa. The history books record that the German High Command did not fail their troops in the field. They coordinated the delivery of necessary supplies for the Afrika Korps with the Italian government. "Despite everything," (the claims that the Italians weren't shipping enough to North Africa), "the Italians succeeded in putting an average of 72,000 short tons - or just above Rommel's current consumption - across the Mediterranean in each one of the four months from July to October"(1942).(17) This was significant considering that Malta was held by the British and that Axis shipping in the Mediterranean was vulnerable to interdiction. Rommel's difficulties, therefore, stemmed less from the dearth of supplies from Europe than from the impossible length of his Line of Communications (LOC) inside Africa.(18)

Rommel's logisticians tried everything they could think of to deliver required supplies along an ever increasing LOC in North Africa. Several actions to acquire host nation support from the Vichy French resulted in truck lorries (trucks which

pulled low-bed, sideless trailers covered with canvas), coastal shipping, stevedoring at the ports of Bizerta and Tripoli, and personnel to run the regional railways.(19) These host nation support agreements with the French, however, did not alleviate the logistical problems for Rommel. North African ports, small in comparison to European ports, were interdicted by the Royal Air Force (RAF), reducing discharge rate by as much as 50%. The same can be said for the local motor transportation for which the Germans contracted. Nearly 50% of the French lorries were interdicted by the RAF. The rail system with host nation rail workers could not overcome the problems associated with getting hit by enemy aircraft. Even on occasions when supplies were delivered across the LOC by host nation support assets, the Germans still had difficulty in moving them the last several kilometers and distributing them to the front. Local nationals could not be counted upon to meet this need because there were too few of them. Furthermore, the commercial vehicles did not hold up under the harsh environment and heavy use.(20)

Rommel found that he did not have adequate military truck transportation to supplement that which the host nation could provide. Looking at the Wehrmacht in the late 1930's and early 1940's, one sees that it was only partly motorized and unsupported by a very strong motor industry. Much effort was placed in obtaining armor and half-tracks. Truck transportation came further down the line of priorities - although it was cheaper in cost.(21) Martin Van Creveld states in Supplying

War that ". . . more significant than any of the factors (leading to Rommel's defeat) . . . were the distances that had to be overcome inside Africa. These were out of all proportion to those that the Wehrmacht had met in Europe. . . and there was little motor transport to bridge them."(22) The point is that when host nation support agreements failed to meet the total transportation requirements of the German Army, there was not enough military motor transport to ensure success at the tactical level. Supplies could not be delivered from railheads and inland terminals to soldiers at the front.

Motor transport held the key to flexibility. The underdeveloped transportation networks of North Africa, the interdiction of railroads and coastal and inland barge shipping, and the political instability of host nations during time of war underscored the fact that the military truck and its driver were the keys in moving stockpiles from the rear to units at the front. The resiliency, redundancy, and economy which the truck provided made it preferable to aircraft, barge, freighter, and locomotive which were more expensive and entailed longer acquisition periods.(23) Rommel's North African difficulty lay with the accumulation of large stocks, an over-reliance upon host nation support, and the deleterious impact of interdiction and distance on tactical logistics operations. Military motor transportation might have provided Rommel the flexibility he required for victory. Host nation support and scavenged vehicles certainly did not.

V. VII U.S. CORPS IN WORLD WAR II - 1945

The VII U.S. Corps' offensive across Europe in World War II presents excellent teaching points for the present day military officer in regard to transportation. Collectively, the lessons learned highlight the importance of logistics in providing flexibility to the ground tactical operation. Specifically, the lessons highlight the flexibility and durability offered by military motor truck operations.

As the VII Corps moved across Europe it became obvious that the rail lines would take a great amount of time to repair and put back into operation. It also became apparent that there would be many items which would not be procured from the local economy simply because of the destruction to local communities and the lack of raw materials. Most of the skilled local workers had been displaced and what production existed was not well organized. France and Germany were literally disaster areas. The American army in 1945 found itself fighting across a land which had been beaten down from the combat between the Allies and Germans. The host nation transportation system was in shambles.(24)

Yet, many of the same predicaments will befall the modern day corps. A modern corps will fight in offensive operations to regain lost terrain. As the enemy is thrown back the captured terrain more than likely will be stripped of people, resources, and facilities. Towns and villages will be devastated, rail lines will have been interdicted, and few skilled workers will be found. Significantly, many of the so-called available civilian

trucks either will have been destroyed, already seized by the enemy, claimed by other friendly units, out of operation, or consumed by motorized refugees. The answer for the modern day corps, as it was for the VII Corps, can only be the military truck.

History illustrates that when an army attacks and begins to regain lost terrain, the traffic flow of materials, supplies, and men is a two way process. VII Corps found that its retrograde requirement was nearly as great as its forward resupply mission. Refugees, POW's, contaminated equipment and clothing, medical evacuation, and relocation of forward units are but some of the possible retrograde requirements.(25) Today's doctrine speaks of this retrograde mission in FM 100-5. It emphasizes the role in which retrograde operations play in war.

Retrograde operations are also used in operational maneuver to reposition forces, shorten lines of communications, or to permit the withdrawal of another force for use elsewhere. A disorganized retrograde operation in the presence of a strong enemy invites disaster.(26)

Without sufficient tactical transportation assets and drivers the VII Corps could not have been able to move cargo forward and rearward at the same time. Additionally, the VII Corps commander had the capability to do something that present day commanders desire -- the flexibility to move soldiers from one place to another on the battlefield. It is a well known story that elements of Major General Terry de la Mesa Allen's 104th Infantry Division were motorized by a simple order of General Collins in March of 1945. Truck companies were used to

move this infantry unit from one part of the Corps sector into position in another part of the sector.(27) Motor truck operations provided General Collins with the flexibility he required to accomplish his overall mission.

VI. MODERN LIFT CAPABILITY

While history has proven the cost of insufficient transportation, current doctrine, structure, and equipment create ever growing requirements for the scarce transportation assets available at the tactical level. A comparison of transportation capability and requirements for a hypothetical maneuver brigade will assist in identifying transportation shortfalls and classes of supply which might create problems in the next war. For my example, I will use a four battalion brigade, a forward support battalion, an artillery battalion, and the CEWI, engineer, and chemical elements from the division base, a total of 4,057 personnel.

I will begin by determining the supply requirements for the brigade, assuming a defense mission. Requirements will be based upon consumption factors from current army field and reference manuals. These consumption factors are expressed in pounds or gallons per soldier/day for each class of supply. They are presented below in Table 1.

Table 1

<u>Class of Supply(28)</u>	<u>Daily Consumption Factor</u>
I	4.03 lbs/soldier
II	3.67 lbs/soldier
III	53.70 gal/soldier

IV	8.50 lbs/soldier
V	31.29 lbs/soldier
VI	3.20 lbs/soldier
VII	15.00 lbs/soldier
VIII	1.22 lbs/soldier
IX	<u>2.50 lbs/soldier</u>
Total	60.91 lbs/soldier
	53.70 gal/soldier

Total consumption is derived by applying the consumption factors in Table 1 to the end strength of the brigade performing the defense mission. As stated earlier, I assume a strength of 4,057 personnel. The brigade's total consumption for classes III and V are adjusted slightly in accordance with published army guidance based upon assigned missions. Consumption for each class of supply is expressed in short tons or gallons and is reflected below in Table 2.

Table 2

<u>Class of Supply</u>	<u>Total Consumption(29)</u>
I	8.0 ST
II	7.0 ST
III	217,000 GAL
IV	17.0 ST
V	655.0 ST
VI	6.0 ST
VII	30.0 ST
VIII	2.0 ST
IX	<u>5.0 ST</u>
Total	730.0 ST
	217,000 GAL

The total consumption column in Table 2 provides the quantity of supplies which must be moved forward of the brigade support area to units in combat. Doctrine is specific as to how this is performed. FM 63-20, Forward Support Battalion, stipulates that a forward support battalion operates supply points in the brigade support area from which supported units pick up their supplies. One exception to this concept is the 370 ST of class V which the supporting artillery battalion will pick up from the corps operated Ammunition Supply Point (ASP). Reflected below in Table 3 is the forward support battalion's daily capability to receive and issue supplies to supported units. Quantities are expressed in terms of short tons or gallons per day.

Table 3

<u>Class of Supply</u>	<u>Receipt/Issue per Day(30)</u>
I	9.75 ST
II	14.45 ST
III	83,600 GAL (distr)
IV	5.50 ST
V	350.00 ST
VII	5.97 ST
IX	5.00 ST

The forward support battalion (FSB) will do everything possible to keep the quantities reflected under the Receipt/Issue column uploaded to facilitate mobility. The FSB must remain as mobile as the units it is supporting in case of enemy penetration into brigade rear areas or friendly force attack and advance. Supplies in the brigade support area are preferably transferred

from FSB transportation assets to supported unit vehicles just as in VII U.S. Corps in 1945.(31)

By contrasting the consumption requirements in Table 2 with the Receipt/Issue capabilities in Table 3, a tactical level transportation shortfall is identified. Brigades in contact will require more of classes III, IV, V, and VII than the FSB can provide with organic assets. The Army, however, has provided additional lift at the tactical level external to the FSB to deliver supplies to battalion task forces. A quick review of the tactical transportation system supporting and augmenting the FSB will help to determine the extent of the shortfall.

Additional quantities of classes III, IV, and VII can be transported to the brigade support area by division assets. The division commander has the capability of weighting the support he provides to subordinate commanders. This is usually accomplished through the establishment of priorities and the subsequent commitment of resources. A maneuver brigade, if identified as a division's main effort, will receive additional supplies to ensure mission accomplishment. A brigade not identified as the main effort may, or may not, receive required support based upon availability of transportation and supplies. Beyond additional quantities of classes I, II, and IX, the division simply does not have the transportation assets to deliver a brigade's total supply requirement. Not all of the required classes IV and VII will be delivered to the brigade support areas because experience shows that the transportation company in the division's main support battalion is usually tied

up moving replenishment stocks of repair parts, class I, class II, other common user requirements, and performing retrograde operations. Additionally, the FSB does not have the assets to keep the supplies uploaded and mobile.(32)

Truck companies from the Corps Support Command (COSCOM) may be assigned the mission of resolving the shortfall of classes III and V in the brigade support area by "throughput" operations. Throughput is defined as the shipment of supplies or movement of personnel from points of origin as far forward as possible, bypassing intermediate supply or personnel activities.(33) In this example, corps units would bypass division. COSCOM petroleum transport battalions are capable of moving 1.2 million gallons of class III when fully mobilized. Likewise, COSCOM medium truck companies can deliver class V from corps operated ASP's to the brigade support areas. The throughput of classes III and V to the brigade support area is achieved by trailer transfer, the delivery of one full trailer and the back haul of an available empty. The total amount of classes III and V which a corps can throughput down to a brigade is significant and can only be constrained by the number of assets which the corps commander allocates to support a brigade operation. Thus, supplies can be transloaded from corps assets directly onto FSB or battalion task force assets in the brigade support area.(34)

Having briefly presented the considerable amount of transportation which can be assembled to move supplies forward to the brigade support area, the paper will now focus upon the FSB and the battalion task forces which are charged with moving these

supplies forward the last 15-20 kilometers. Battalion task forces are authorized support platoons which have petroleum and transportation sections. These sections are committed to moving class III and class V from the brigade support area to the front. Given the consumption rates of modern weapons systems, these vehicles are usually employed and unavailable to transport other supplies. Additionally, most commanders maintain an emergency resupply of classes III and V uploaded in their combat trains area. This necessary requirement serves to tie up several delivery systems. Remaining cargo vehicles in the battalion support platoons are committed to transport classes I, II, IX, and personnel. At present organizational levels the task force is unable to transport the required quantities of classes IV and VII reflected in Tables 2 and 3.(35)

The FSB is in no better condition to deliver the required quantities of classes IV and VII to the front. Aside from the lift assets to move, store, and issue classes III and V, the supply company of a forward support battalion is left with one 12 ton van, two 22.5 ton semitrailers, and one 5 ton cargo truck (this vehicle is used for the sections equipment and transportation).(36) Experience reveals that classes I and II (including chemical protective overgarments which have a very high cube) will be uploaded onto these vehicles. The cube factor of class II items is significant because cargo space is exhausted before maximum payload is attained.(37) The lack of additional transportation assets to upload and deliver supplies results in a 35.5 ST lift shortfall of classes IV and VII for a brigade in

contact. This is reflected in the class IV and VII columns in Tables 2 and 3.

VII. ANALYSIS

The transportation shortfall presented above is expressed in numbers and units of measure. However, it is difficult to relate the severity of a problem by numbers alone. Logisticians are routinely regarded as "bean counters" by combat arms officers who claim that they use too many numbers in their overly conservative estimates and arguments. The analysis which follows attempts to translate the numbers into identifiable results and situations which could occur in future combat operations. The analysis is based upon the use of "lessons learned" compiled by the Combined Arms Training Activity at Fort Leavenworth, from observation of training by heavy forces at the National Training Center (NTC), Fort Irwin, California, and upon a series of interviews with former key leaders from brigade and division level organizations.(38)

The analysis begins by focusing on the brigade commander's concern for keeping the brigade support area mobile. He will not want to accumulate large stocks of supplies in his support area unless they are uploaded onto trailers or trucks. Once supplies arrive in the brigade support area the brigade commander will not want to offload them onto the ground. Any supplies which are offloaded and stocked in the brigade support area become inhibitors to movement and responsive support at forward locations. The brigade commander expects the Division Support

Command (DISCOM) to deliver supplies to him, since he cannot afford to use his assets to travel back to the division support area to pick up classes I, II, IV, V, and IX. The brigade commander desires a delicate balance, adequate supplies to meet requirements without a large surplus to hamper his movement.(39)

The DISCOM commander, however, has other concerns. He is tasked with providing support to five brigade-level organizations simultaneously. In doing so, he cannot afford to move his trailers and drivers forward of the brigade support area to assist in alleviating transportation shortfalls there because of the long lead times involved in transporting supplies to the task force combat trains area (a distance of up to 50-60 kilometers), and because of the vulnerability of his vehicles to enemy fires. For these reasons the DISCOM commander is reluctant to commit his transportation assets forward of the brigade support area. Doing so could result in loss of control, the destruction of the motor fleet, and a failure in his overall mission.(40)

A review of these circumstances will highlight the DISCOM commander's predicament. The use of DISCOM trucks to deliver supplies to the combat trains ties up the truck and/or trailer for the amount of time it is forward. With only thirty-six (36) 5 ton cargo trucks and thirty-two (32) 5 ton tractor-trailer systems in the division truck company, the loss of any assets to brigade areas for extended periods of time reduces the division commander's ability to sustain the entire force. Even if throughput supplies were delivered to the combat trains area on DISCOM assets, maneuver battalion soldiers would have to offload

them due to the lack of materiel handling equipment in forward locations. This offloading would take time and resources which neither the DISCOM nor the maneuver unit has. Offloading difficulties would be compounded by the bulk nature of cargo arriving from the division support area. The only pieces of equipment presently capable of offloading division trucks with bulk cargo in the combat trains area are M88 recovery vehicles, and as can be expected, they are already fully committed recovering vehicles and pulling main assemblies for maintenance.(41)

Vehicles assigned to the DISCOM's transportation truck company present soft targets to the enemy. During normal combat operations vehicles will more than likely arrive in brigade support areas without extensive hardening (e.g. sandbagged cargo beds and reinforced armor plating). While this hardening action increases protection, it reduces the total available payload which can be transported. This only serves to increase vehicle requirements. DISCOM vehicles which are outfitted for ringmount machine guns may or may not have gunners; manning levels often do not allow for it. Accordingly, DISCOM vehicles provide the enemy with lucrative soft targets. The continual loss of trucks through interdiction as well as maintenance related problems will prevent the DISCOM commander from committing trucks forward to task force combat trains areas. In fact, the DISCOM commander will demand as quick a turnaround time as possible between his supply and service company's supply points in the division support area and those in the brigade support area, thereby maximizing his small truck fleet.(42)

The battalion task force commander is equally concerned as to the tactical transportation capability of his supporting units as well as his own. Interviews with a former battalion commander, executive officer, and operations officer revealed that the task forces can move classes I, II, III, V, and IX, personnel, and casualties to and from the front, but do not have enough assets to move class IV. Personnel interviewed did not have experience in moving class VII. However, they believed that based upon their experiences they would not have had sufficient vehicles to transport class VII if tasked to do so. Battalion task force leaders were also concerned about the accumulation of large stocks in their field trains area which would impede their mobility. They would strongly oppose any move by the FSB to transfer excess stocks to their field trains area. Thus, it appears that the battalion task force, much as the brigade, requires sufficient supplies in a timely manner, but not in excessive amounts.(43)

In an effort to keep large amounts of bulk class IV out of the brigade support area, the army is moving to the prepalletization of class IV in barrier sets. Plans call for class IV to be prepackaged and preconfigured for frontline troops based upon unit strength, mission, and terrain. The question becomes how much class IV and accompanying V is required in different environments? In open terrain like that of the National Training Center in the Mojave Desert and Southwest Asia, experience shows that five barrier-obstacle sets are required per battalion task force. In closer terrain, like that of Central

Europe and Central America, eight smaller sets are required.(44)
 An example of a class IV preconfigured unit load is provided in
 Table 4.

Table 4
Preconfigured Unit Load (Barrier)(45)

<u>NSN</u>	<u>NOMENCLATURE</u>	<u>QTY</u>	<u>UI(46)</u>
5660-00-251-4482	Barbed Wire	1	SL
5660-00-921-5516	Barbed Tape	20	RO
5660-00-270-1587	Post, Fence	54	EA
5660-00-270-1589	Post, Fence	4	EA
8415-00-926-1674	Gloves, Barbed	3	PR
5120-00-926-7117	Mallet, Wooden	1	EA
8430-00-823-7451	Pin, Tent Steel	133	EA

Although none of the interviewed officers had worked with the prepackaged loads reflected in Table 4, it is estimated that two to three of these packages could be loaded upon a 5 ton cargo truck (depending upon the amount of concertina wire and fence posts). The estimated weight of these bundles is between .4 and 1 ton per bundle. Multiplying the average weight for preconfigured class IV bundles by the number of task forces in the sample brigade performing a defense mission validates the consumption rates reflected in Table 2. For example, if three battalions were defending forward and one were in reserve, the total weight of prepackaged class IV bundles for three battalions in close terrain (8 x 3 x .7) would approximate the projected 17 short tons in Table 2. When considering that the class IV

requirements of the remaining forces in the brigade sector are not included in this figure, it suggests that the consumption factors in published army reference manuals are conservative.

The dilemma of moving classes II and IV in a responsive manner while not overburdening the combat trains is best summed up by a former task force commander: "Repetitive runs cannot always meet the requirement to deliver supplies forward in a timely manner for the defensive mission. Conversely, for delay and attack missions, the field trains area is overwhelmed with classes II and IV which preclude mobility and invite their abandonment. I want the FSB to move it to me -- or give me the assets to move it and keep it uploaded."(47)

FM 5-100, Engineer Combat Operations, provides the following solution to the movement of class IV forward of the brigade support area:

Most brigades consider barrier material an engineer asset and allocate it to the engineer company. The engineer company is often tasked with internal distribution of class IV/V barrier materials throughout the task force sector resulting in reduced engineer capability and loss of control of barrier material within the brigade. . . Task forces should routinely request the forward support battalion to move significant amounts of its engineer class IV/V material forward.(48)

This idea of assigning the mission of moving class IV to the forward support battalion seems good at first glance. But a recent lesson learned from training at the National Training Center provides evidence of the inability of the FSB to respond to the tactical commander's plan.

The forward support battalion's supply company requires a transportation platoon with associated materiel handling equipment (MHE). . . This would enable them to adequately support the brigade with the mission of transporting class IV to the logistics resupply point. On occasion, the task force was unable to incorporate planned obstacles into the barrier plan because the class IV was not delivered in time due to a lack of transportation assets in the forward support battalion.(49)

Assuming that the corps and division are delivering sufficient quantities into the brigade area, the class IV and class VII problem (for it surely will exist in time of war) is twofold. On the one hand the FSB does not have the transportation assets to keep the supplies it will require uploaded. It cannot begin to think of transporting them to the front line units. If the FSB commander attempted to deliver supplies forward to one of the task forces with one of his 22.5 ton semitrailers he would lose over one third of his daily issue/receipt capability for classes I, II, IV, and VII. While doing so, other supplies would accumulate thus degrading his ability to support the other supported units in the brigade sector. On the other hand, the task forces do not have the transportation assets themselves to pick up and deliver supplies to their front responsively.(50)

In completing the analysis of the tactical transportation shortfall it is important to emphasize that the lessons learned at the National Training Center, which validate the deficiency, were obtained by observing brigades operating with only two-thirds of their maneuver elements and only a portion of the units

which would be located in the brigade rear. Moreover, tactical lift shortfalls could increase depending upon levels of interdiction, competition, weather conditions, and friction. One can only speculate how much greater the shortfall would be if the logistics system were exposed to greater stress and demands.

VIII. INTERDICTION, COMPETITION, AND FRICTION

We have seen the importance of transportation at the tactical level through the review of three historical offensives. They highlight some of the concerns which still confront present day tactical commanders and logisticians. Since World War I interdiction, environment, and friction have adversely impacted upon efforts to deliver supplies and materiel to front line soldiers. In the modern era, the huge appetite for supplies generated by technologically advanced weapons systems and the growing number of customers requiring support in forward areas create new demands for present day commanders. What impact will all of this have upon the transportation shortfall identified earlier in this monograph?

Interdiction reduces the amount of supplies delivered to front line units. World Wars I and II highlighted the problems created by enemy interdiction. Rail lines were cut, highways were cratered, motor convoys were ambushed, and depots and logistics bases were bombed. With interdiction by Spetznez, airborne, air assault, artillery and air forces the U.S. Army might discover limitations to the wisdom of productivity analysis studies it commissioned.(51) For example, suppose a pipeline was

interdicted by a small enemy raiding party. A study concluding that three pipeline units could replace nine petroleum truck units would be found deficient as the army faced a shortfall in petroleum transport because of a lack of redundant motor transportation assets at corps level.

The movement of petroleum is not the only area affected by interdiction, nor will the regular army be the sole recipient of enemy interdiction effort. Host nation territorial forces and other allied armies will also be disrupted. As transportation assets and networks become interdicted, the requirement for cross country movement will increase. Military and commercial tractors belonging to the host nation territorial forces, allied forces, and U.S. Army support units should be capable of moving general cargo and petroleum off of paved roads. This off-road requirement will quickly wear down vehicles not designed to haul heavy payloads across rough terrain.

Another concern is competition. A variety of missions will compete for existing tactical level transportation assets. On the surface this may not appear different from past wartime conditions. However, the competition for scarce assets has intensified with AirLand Battle doctrine. Deep battle missions for the Multiple Launch Rocket System (MLRS), division and corps aviation brigades, and division and corps counterattack forces will generate increased demands for transportation. Additionally, tactical commanders must respond to rear battle threats. Designated forces, together with accompanying supplies, will require responsive transportation in combatting these

threats.(52) Finally, light infantry will compete for transportation. Given the probability of combined light and heavy operations on the next battlefield, light forces will require transportation for positioning, relocation, and resupply. Without augmented transportation, light forces will not be able to keep pace with their mechanized counterparts. All of these demands for transportation will compete directly with those of the maneuver brigade in contact. This intensified competition could result in confusion, mission shortfall, and unnecessary diversion of effort.

Friction and uncertainty, two Clausewitzian concepts which contribute to battlefield confusion, have always impacted upon tactical transportation.(53) The unknown always generates additional requirements and decisions. We can only estimate and guess as to the "unknown" transportation requirements of actual war. But we can list a few sources of future friction at this juncture. First, the next war, regardless of theater, will present commanders with the problem of refugees. For the first time in history, the large scale movement of panic-stricken civilians, fleeing for their lives with as much of their personal belongings as they can carry, will be accomplished by automobiles and trucks. This will impact upon asset availability, traffic congestion, and lift requirements.

Trailer transfer is another likely source of friction in future war. The trailer management system at ammunition transfer points and other forward supply points is likely to fall prey to the age old problem of hoarding. The reasons for hoarding by

forward units are numerous and often based upon legitimate need. They range from the desire to store additional supplies, to non-transportation uses such as barriers and shelters. Logisticians at first, and then commanders, will have to address this problem. As Van Creveld recounts in Supplying War, even Napoleon had to intervene in his campaigns personally to order his subordinate commanders to return hoarded supply wagons and horses back to the army's sustainment operation.(54) The problems which Napoleon faced will only be magnified on the modern battlefield.

Presently, the army places great emphasis in its force structure on the repair of deadlined vehicles. It is here that manpower has been focused. Given fixed end strengths in a limited manpower era, army units are authorized but one driver per vehicle.(55) With such thin manning, one wonders how long trucks will retain their drivers? A truck can be repaired faster than a driver. Surely, men will suffer at least as much wear and tear as the vehicles they drive. The question is whether tactical units will be able to maintain sufficient drivers for their trucks given interdiction and heavy loss rates? What will the brigades and divisions do to make up for the combat soldiers who are pulled out of the line to drive military or scavenged vehicles? Again, by its peacetime policies, the army may be contributing to, as opposed to reducing, future friction on the battlefield.

Finally, the size and composition of present day maneuver and fire support units generate huge transportation requirements for supplies, equipment and personnel. The employment of heavy

forces on the contemporary battlefield conjures up thoughts of M1 tanks, M2 Infantry Fighting Vehicles, AH64 attack helicopters, and MLRS artillery engaged in deep, rear, and main battle operations. All of these will certainly be present on the next conventional battlefield. In addition to these type units, however, support and service support forces will occupy forward areas. These units will require supplies, replacements, and major assemblies to provide support to high technology systems mentioned earlier. With increased numbers of advanced weapons, support, and communications systems in forward areas, the consumption rates for technical supply has increased dramatically. The emergence of "black boxes" on the battlefield has replaced component repair. The growing number of requirements to deliver "black boxes" to the front will have a corresponding impact on the delivery of other supplies.

Interdiction, competition, and friction will adversely impact upon army forces in future wars. Given their presence, the estimated transportation shortfall identified in this monograph will multiply quickly. Therefore, army solutions must provide some degree of certainty and flexibility. Several solutions have been recommended and discussed by army officials over the past decade. Among these, however, two enjoy strong support today. These solutions, host nation support and scavenging, will now be examined to determine if they provide the certainty and flexibility required while resolving tactical transportation shortfalls.

IX. THE PANACEA OF SCAVENGING AND HOST NATION SUPPORT

Earlier in this paper, the Secretary of the Army and former Chief of Staff were quoted as saying that the army planned on support from host nations around the globe to resolve logistics shortcomings of the active force. Included in these shortcomings is the tactical transportation shortfall identified in this paper. There are indeed benefits from the integration of host nation support. France proved to the modern military officer just what can be accomplished using national assets as Paris taxicabs were successfully used to deploy French soldiers to blunt a possible German breakthrough at the Battle of the Marne in 1914.(56) In fact, a significant percentage of the tactical lift shortfall which exists at the division and corps level will be satisfied by host nation support and requisition, especially in a European scenario. Territorial forces will provide augmented lift to tactical units down to the brigade rear.(57)

But there are problems in the overreliance of host nation support, especially at the tactical level. The large quantities of supplies arriving in the brigade support area represent the end of a long line of communications which has its roots in the nation's economy and industry, and which is supported along its way by allied and host nation support. History has demonstrated that host nation support is best used to augment military transportation at corps level and higher. While host nation contractors, drivers, and repairmen have demonstrated that they are invaluable assets at the operational level of war, they have not always demonstrated reliability in the face of interdiction

and destruction.(58) Applications and advantages from host nation support are numerous at the strategic and operational level of war. Bus transportation from aerial and sea ports of debarkation to assembly areas and railway operations are just two of the many which come to mind.

However, it is safe to assume that the soldier will still bear the brunt of the tactical transportation problem in future wars. To suggest that our troops at the front will have to rely on non-military equipment to deliver supplies over the last and most crucial leg of the line of communications somehow seems less than a fullproof solution when the impact of interdiction, competition and friction are taken into account at division level and higher.

Recently, the idea of scavenging to satisfy tactical logistical shortfalls has surfaced in military journals and writings. Brigadier General Wayne A. Downing, in an article regarding the integration of light infantry in Europe stated,

Just as light infantrymen are expected to be proficient battlefield scavengers, units must be expert foragers. Host nation support (HNS) appears to be a viable solution to the CSS deficiencies plaguing light infantry in Europe. Liaison with German territorial forces (the Verteidigung bezirkkommando (VBK)/(VKK)) is the essential requirement to "tap" the largess of material and services available in the highly developed European countryside. But HNS will not just happen. It requires detailed planning, good reconnaissance, close and continuing coordination with territorial forces and ingenuity on the part of the U.S. forces.(59)

The proponents of scavenging are correct when they point to the benefits which can be achieved from aggressive, action-oriented, and ingenious combat leaders. As Major Larry D. Harmon states in his monograph, Scavenger Logistics in Support of Tactical Operations,

The key is that there are alternative sources of sustainment available to a commander to complement his traditional, formal sustainment system.(60)

It is important for our commanders and logisticians to appreciate the benefits which can be realized from scavenging on tomorrow's battlefield. It is equally important to promote improvisation and imagination. However, as has been shown in the Meuse-Argonne, Rommel's operations in North Africa, and by the U.S. VII Corps in 1945, scavenging and host nation support supplement the logistics operations far above the battalion task force and brigade level. Military professionals should not expect host nation support and scavenging to meet the tactical lift shortfall of heavy combat forces forward of the brigade support area.

General Downing acknowledges the tremendous effort which accompanies scavenging and requisitioning. Such an effort by combat soldiers will require extensive planning and training at home stations. Leaders, as well as subordinates, will have to know how to plan for, acquire, and operate transportation assets scavenged from host nations. This underscores the importance of training. It implies tasks, conditions, and standards. This may be an attainable goal for light infantrymen stationed in CONUS.

However, we need to ask whether/if heavy forces have the time and personnel resources to train on becoming proficient on host nation acquisition, operation and maintenance when they must maintain skills as related to their organic mechanized weapons system?

Two assumptions are made by many proponents of scavenging relating to the adequacy of assets and availability of drivers. The first, that adequate numbers of vehicles will be available for tactical use, could lead to severe problems in areas of the world where alliances and host nation agreements are not as firm and developed as they are in Europe and Korea. As stated earlier in the paper, the thought of every friendly unit competing for the same vehicle during chaotic wartime conditions is disconcerting. It implies a lack of control. May the better unit win! Moreover, vehicles may not be available because owners have used them to flee to safety.

Secondly, who will drive and maintain scavenged vehicles? If the army plans on combat infantrymen, tank crewmen, and artillerymen to drive scavenged vehicles then maybe the issue of increasing "foxhole strength" should be readdressed to allow for this diversion. We have already discussed the difficulty of maintaining drivers for organic military vehicles. Before diverting assets to drive scavenged trucks the army should plan to provide relief to its current drivers who are expected to drive for 20 hours/day for the first several weeks of the war.

X. DOCTRINAL IMPLICATIONS

Military historian Michael Howard once wrote of the important responsibility military officers have in ensuring that the army's doctrine and organization are not too far wrong at the outbreak of war. He referred to it as their most important mission. Howard suggests that no country will ever enter war with the completely correct doctrine and organization. He stresses the point that we must be closer to being correct than the enemy -- or be able to make up the difference faster.(61) Our current military organization has not provided the necessary lift in tactical level units. I agree with the proponents of host nation support, scavenging, and contracted support as means to meet known transportation deficiencies. The army's track record of planning in Europe, Southwest Asia, and the Pacific reveals the enormous benefits of host nation support at the operational and strategic level. However, the army has a clear requirement for additional transportation at the heavy brigade level (i. e. the tactical level) as reflected by the numbers, facts, and observations in this monograph. The problem requires attention. In answering Howard's charge, two alternatives to host nation support and scavenging are offered for consideration as a means of solving the transportation shortfall.

Current doctrine stipulates that FSB's will provide supply point distribution in the brigade support area.(62) Under the first alternative, authorization for four additional 5 ton cargo trucks in each battalion task force would facilitate the transportation of 5.6 short tons of class IV and up to 10 short

tons of class VII. These additional trucks would be assigned to battalion support platoons. Since timely delivery of class IV is critical, vehicles could be uploaded and staged in the battalion field trains area awaiting call forward instructions. This solution would not only provide a responsive solution to the task force commander, but would also eliminate the class IV stockpile problem confronting the FSB commander. The two trucks earmarked for class VII would also provide some flexibility to the task force commander in moving any other backlogged classes of supply to forward areas. Under this proposal, brigades would receive twelve or sixteen additional trucks depending upon the number of assigned subordinate battalions.

A second proposal provides for the central management of transportation assets in the brigade support area. This proposal would authorize an eleven member transportation section for each FSB. This section, consisting of ten 5 ton cargo trucks, would operate as part of the FSB's supply company. A Transportation Corps noncommissioned officer would serve as section sergeant and dispatcher. This proposal would satisfy brigade-wide transportation requirements for classes IV and VII by providing uploaded supplies in the brigade support area awaiting call forward instructions. Additionally, this proposal provides a degree of flexibility to the brigade commander in the form of transportation for unforecasted supply surges, backup medical evacuation, and the movement of assigned or attached dismounted infantry from one location to another in the brigade sector. This proposal would add ten trucks to each brigade regardless of size.

However, this proposal does not support the present doctrinal concept of supply point distribution in the brigade support area.(63)

Our doctrine is one of maneuver and firepower. Army leaders are trained today to fight a non-linear battle, to be prepared to go on the offense and to mass fires and forces at the decisive point on the battlefield. This is the spirit of FM 100-5 -- agility, initiative, depth, and synchronization. These four tenets of AirLand Battle cannot be achieved unless the army ensures flexibility at each organizational level. FM 63-2, Combat Service Support Operations - Division, states, "Combat Service Support commanders must not only be willing to perform responsibly, they must have built-in flexibility and the authority to seek and implement innovative support concepts." The army faces a challenge in keeping its logistics system in step with recent doctrinal changes. Defensive thinking still persists. Recently fielded logistics systems, oriented toward supporting position defensive operations, can still work effectively at corps and higher levels. These systems, which produce great savings in manpower and money, include the Containerized Ammunition Delivery System (CADS), and the Palletized Loading System (PLS).

The emphasis placed upon cache points, large forward stockpiles, and tactical pipeline systems only underscores the lack of mobility in today's army units.(64) Tactical logisticians are losing the flexibility to move from one mode of transportation to another; or more critically, from one asset to another. The army's focus has been on bulk and volume at levels above the

brigade support area. However, at some point on the battlefield, and it appears through study that the brigade support area is the likely place, commanders must have the flexibility to move and distribute supplies forward while maintaining overall mobility. Today's doctrine calls for trucks and mobility -- not for stockpiles at the front.(65)

In correcting existing shortfalls in its logistics delivery system, the army can choose from an array of alternatives. Three proposals have been presented in this paper. First, the army could plan to acquire and scavenge more trucks from host nations for use by brigades and battalion task forces. Brigades could institute training to prepare officers and soldiers for the acquisition, operation, and maintenance of such vehicles. This course of action, however, provides no guarantee as to the availability of assets and drivers. Secondly, the army could satisfy the existing tactical shortfall by authorizing the battalion task force commander the assets to pick-up supplies in the brigade support area and deliver them to forward locations. Third, the army could give the forward support battalion commander the mission and assets to move class IV and VII forward of the brigade support area.

I appreciate the difficult decisions which the army must make in deciding what is to be funded and what is not. The realities of competing demands have not changed greatly over the years. In many ways it is the 1920's all over again. The high technology items are garnering the funds. Motor transportation, although a poor competitor of the M1 tank, M2 IFV, AH64 attack helicopter, and

the MLRS in the budgetary process, is a durable and consistent part of modern war.(66) No large scale war has been won without large numbers of them. If the money is not there to fund tactical level increases in transportation assets, then the army must address the problem in other ways, either through logistics plans, agreements, or doctrinal changes. There will come a time, however, when the policies and procedures designed to correct tactical transportation shortcomings will prove to be insufficient and inflexible. If AirLand Battle doctrine requires tactical commanders to exercise certain capabilities then the army should provide its tactical commanders with the assets to achieve them. Build in some flexibility with the addition of vitally needed military trucks and the manpower to operate them.

ENDNOTES

1 Martin Van Creveld, Supplying War, (London: Cambridge University Press, 1977), p. 200.

2 Richard H. Thompson, "Reshaping the Logistics Force", Army Logistician, (September-October 1984), p. 3.

3 John O. Marsh and John A. Wickham, "Army Logistics Posture Summarized", Army Logistician, (July-August 1984), pp. 8-9.

4 Roger Beaumont, "Beyond Teeth and Tail", Military Review, (Ft. Leavenworth: March 1985), p. 5.

James A. Huston, Sinews of War: Army Logistics, 1775-1953, (Washington, D.C.: Department of the Army, 1965), pp. 542-43.

5 U. S. Army Field Circular (unnumbered), Preconfigured Unit Loads, (Fort Lee: November 1985), pp. 1-14.

6 Lieutenant General John R. Galvin, "VII Corps Commander Views Grass Roots Logistics", Army Logistician, (July-August 1984), pp. 2-7.

7 Huston, The Sinews of War: Army Logistics, 1775-1953, p. 369.

8 Ibid., p. 383.

9 Ibid.

10 Ibid., p. 378.

11 Ibid., p. 386.

12 Ibid.

13 Alfred F. Hurley, Billy Mitchell, (Bloomington: First Indiana University Press, 1964), pp. 58-63.

14 Van Creveld, Supplying War, p. 199.

15 James L. Stokesbury, A Short History of World War II, (New York: William Morrow and Company, Inc., 1980), p. 147.

16 Ibid.

17 Van Creveld, Supplying War, p. 189.

18 Ibid., p. 200.

19 Ibid., p. 190.

20 Ibid., pp. 186-190.

21 Ibid., p. 201.

22 Ibid., p. 199

23 Ibid.

24 Huston, Sinews of War: Army Logistics, 1775-1953, pp. 526-28.

25 1st U.S. Army After Action Report, (March 1945), pp. 85, 91.

26 FM 100-5, Operations, (Ft. Leavenworth: May 1986), p. 153.

27 VII U.S. Corps After Action Report, (March 1945), pp. 120-125.

28 The army establishes the classes of supply to facilitate action and provide visibility for various commodities. The classes are: class I, subsistence; class II, non-principal items of equipment; class III, petroleum products; class IV, engineer/barrier and military construction equipment; class V, ammunition; class VI, personal use items; class VII, major end items; class VIII, medical; class IX, repair parts; and class X, materials for non-military programs. Class X will not be included in this study.

29 FC 101-5-2, Staff Officers Handbook, (Ft. Leavenworth: March 1987), pp. 7-6 - 7-7. The total consumption is adjusted downward for units assigned defensive missions. Specifically, the 217,000 gal fuel estimate for 4057 personnel could be overstated slightly.

30 These are quantities of supply, expressed in terms of short tons and gallons which forward support battalions are capable of receiving simultaneously from the division and corps support commands and issuing to customers in the brigade support areas. The fuel figure (class III) represents distribution and not storage. Fuel storage assets are used for distributing fuel to customers.

31 Interview E, 14 October 1987.

32 Ibid.

33 Student Text 63-1, Fundamentals of Combat Service Support, (Ft. Leavenworth: May 1986), p. 5-17.

34 Interview E, 29 September 1987.

35 Interview C, 5 October 1987.

36 FM 63-20, Forward Support Battalion, (Washington, D.C.: May 1985), p. 5-21.

37 The Merriam-Webster Dictionary, (New York: Simon and Schuster, Inc., 1974), p. 180.

38 Interviews were conducted with a former brigade executive officer, battalion commander, battalion executive officer, battalion operations officer, forward support battalion executive officer, forward support battalion support operations officer, DISCOM commander, DISCOM executive officer, and DISCOM SPO. Some of the officers had served in these positions in Europe, others in CONUS. Selected officers had participated in training at the National Training Center.

39 Interview C, 5 October 1987.

40 Interview A, 9 October 1987.

41 Interview F, 29 September 1987.

42 Interview A, 9 October 1987.

43 Interview C, 5 October 1987.

44 Interview C, 5 October 1987.

45 FC (unnumbered), Preconfigured Unit Loads, (Ft. Lee: November 1985), p. 16.

46 The acronyms for Unit of Issue (UI) in this table are SL - sling, RO - roll, and EA - each.

47 Interview C, 5 October 1987.

48 Center for Army Lessons Learned NTC Bulletin, (Ft. Leavenworth, Kansas: Combined Arms Training Activity, 1 July 1987), p. 13.

49 Ibid.

50 Interview E, 14 October 1987.

51 Thompson, "Reshaping the Logistics Force", pp. 2-3.

52 FM 100-5, Operations, (Washington, D.C.: May 1986), pp. 19-21.

53 Carl von Clausewitz, On War, (Princeton, NJ: Princeton University Press, 1976), p. 119.

54 Van Creveld, Supplying War, p. 53.

55 Table of Organization and Equipment # 07245J410, Infantry Battalion, (Mechanized) (BFVS), (Washington, D.C.: 1 April 1983).

56 Huston, Sinews of War: Army Logistics, 1775-1953, p. 379.

57 "Tasks and Organization of an Untersteutzungskommando, Wartime Host Nation Support Organization", German General Army Office, (Cologne: 15 January 1985), p. 6.

58 Van Creveld, Supplying War, p. 186.

59 Brigadier General Wayne A. Downing, "Light Infantry Integration in Central Europe", Military Review, (Ft. Leavenworth: September 1986), p. 28.

60 Major Larry D. Harmon, Scavenger Logistics in Support of Tactical Operations, (Ft. Leavenworth: December 1986), p. 5.

61 Michael Howard, "Military Science in an Age of Peace", Royal United Services Institute Journal, (London: March 1974), p. 7.

62 FM 63-20, Forward Support Battalion, (Washington, D.C.: May 1986), p. 5-9.

63 Ibid.

64 Interview A, 9 October 1987.

65 Charles D. Odorizzi, "Can the Army's Tail Keep Up with its Tooth?", Armed Forces Journal, (Washington, D.C.: July 1986), p. 60.

66 Ibid., p. 60.

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