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COMBAT ENGINEERS - MOBILITY - HISTORY  
AIRLAND BATTLE

BY

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**ABSTRACT**

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▶ This essay reviews the historical trends in the employment of combat engineer support to tactical mobility operations. Historical perspectives from US Army operations since the Revolutionary War formulate trends in the relative priority given to tactical mobility versus other traditional engineer roles. The insights gained from the historical review are presented as a set of questions designed to help the AirLand Battle commander more clearly focus on the critical issues associated with modern mobility operations. ◀

## INTRODUCTION

Today's commanders are challenged to see the future battlefield - be imaginative - show initiative. More often, however, the problem with seeing is more a function of filtering and focusing than of broadening ones perspective. There is so much to see and so little time to react that the successful commander is usually the one who can accurately narrow his vision to the critical issues. Experience - a personalized baseline of information - differentiates the daring commander with the confidence to be bold and succeed from the brash officer who destroys his command in rash displays of misplaced initiative. The question of how to gain the depth of experience to be bold but not brash prompted this study. While today's commanders must act quicker and control more, a cursory reflection on war shows that every decision point has been visited innumerable times in other guises. In training the battle captains of today, we must take advantage of the collective, historic experience to help form the filters and focus for success.

Engineers have been with the US Army since the inception of the Continental Army in 1775. Initially an elite group of technically educated officers, mostly foreigners, the Corps of Engineers has evolved with the needs of the army. Missions, priorities and capabilities have varied but engineer support to combat forces can be roughly categorized into four major areas of effort.

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MOBILITY  
COUNTERMOBILITY  
SURVIVABILITY  
GENERAL ENGINEERING

While all areas of support are important, mobility operations are particularly timely in view of the current AirLand Battle (ALB) increased emphasis on maneuver, initiative and agility. In keeping with the primarily tactical focus of today's doctrine in FM 100-5, Operations, this study will stress the tactical mobility aspects of combat engineers. Two themes will be pursued in an effort to instill a degree of consistency.

1. An overall assessment of relative priority placed on the mobility subareas of Counterobstacle, Gap Crossing and Maintenance of Lines of Communication (LOC) during each period examined.

2. A general assessment of where on the battlefield the highest priority for engineer mobility work took place.

The historical review emphasizes what combat engineers actually did versus what doctrine or an operations order may have directed that they do. Excursions from these parameters are limited to events that clarify the main themes.

The purpose of the study is not to present an exhaustive paraphrasing of engineer history but to gain insights into the frictions of war that accompany mobility operations. The questions generated from these insights provide a framework around which today's combat engineer and his supported commander can better focus their efforts for tomorrow's ALB.

## EARLY OPERATIONS

Engineers in the Revolutionary War were central to the survival of the army and consequently to the eventual victory over the British. Highly educated in technical subjects not taught in the colonies, engineers were the principle advisors on terrain, positioning of artillery, friendly fortifications and the reduction of enemy fortifications. Mobility operations of the Continental Army and our French allies were of minimal priority. Travel was predominately by water and close combat largely the resulted when both sides tacitly agreed to meet on the battlefield. Engineer units were virtually non-existent with a few exceptions where skilled craftsmen were grouped together to oversee work on fortifications or sapping and mining operations to reduce enemy positions. The priority of engineer work was clearly on ensuring the survivability of the army followed by countering the operational mobility of the British; missions obviously well done and key to the frustration of the British military might that eventually led to our independence. Only in siege warfare did the engineer significantly contribute to the tactical mobility of the force and then mobility must be viewed as a relative attribute. In the month that the French and Continental armies besieged Yorktown, mobility was measured by the cubic feet of earth dug from the trenches. Though slow, siege operations did permit the attacker to maintain the initiative in reducing an enemy position.

Engineer troop strength up to the Mexican War consisted of a single company located at West Point and dedicated to the instruction

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of the future officer corps. Their contributions to tactical engineering centered on experimentations in river crossing operations on which they were to get a practical exercise in the expedition to Mexico City. Mobility, both operational and tactical, were key to the forces in Mexico and the combat engineers were attached to the lead units to maintain their momentum. Mobility tasks concentrated on the crossing of rivers and gaps and on construction or repair of roads to support the army. The hand picked engineer soldiers did the technical work and supervised work gangs from the infantry on labor intensive projects. Maintenance of LOC was limited to the minimum required to keep the force moving. Rubber ponton bridge trains accompanied the lead elements where most engineer mobility support occurred. Many young officers who would rise to prominence in the upcoming Civil War received their initial combat experience in Mexico as engineers; Robert E. Lee and George McClellan for two.

In summary, tactical mobility operations in the early army were of minimal importance. The composition and missions of the engineers reflected the simple technology and force structure of the army that placed few demands on commanders for rapid movement of armies over extended distances and time. Operational mobility was a key factor throughout the period, however, but the role was evolving quickly from an emphasis during the revolution on denying the enemy mobility to enhancing our own theater movement in Mexico.

## CIVIL WAR

The Civil War in many ways was the first war in which the United States advanced the state of warfare rather than follow the European lead. The influence of technology and large field armies that operated over an extended area of operations foreshadowed the future wars of the early twentieth century. Combat engineer activities underwent major expansion during the war, primarily associated with the movement of mass armies in the field but also influenced by the vastness of the war zone. The Regular Army Engineers expanded to four companies loosely associated with each other and were augmented by volunteer and militia formations that brought their own engineers with them. A total of 8000 men made up the Union engineers during the war or roughly 1.5% of the Army.<sup>1</sup> Numbers for the Confederate Army are difficult to estimate since only two units were authorized and little is known about their operations. Union engineers were assigned primarily to armies or corps. Most of the labor intensive work remained for the levies of infantry to perform under the supervision of the engineer officers. The following missions were assigned to the Corps of Engineers:<sup>2</sup>

- o Construct fortifications around towns/cities
- o Construct roads and bridges for the armies
- o Map areas of operations
- o Select lines of defense
- o Organize temporary defensive positions
- o Reconnoiter enemy positions
- o Conduct sieges

Engineer officers continued to be key members of the staffs and performed most of their assigned missions in an advisory capacity. Engineer units concentrated on mobility operations. Bridging support was the main task assigned to engineers but its intensity varied with the terrain and the nature of the campaign. During the Peninsula Campaigns around Richmond, engineer bridge trains were in continuous action. Crossings were seldom conducted in the face of major enemy opposition but assault crossings were common. The crossing of the Rappahannock in June 1863 could be used as a textbook example of today's river crossing doctrine. Under fire from confederate pickets, infantry crossed in pontons operated by engineers. After the far shore was cleared the engineers threw a ponton bridge across the river that permitted the artillery and trains to cross.<sup>3</sup> Permanent pile or trestle bridges were rapidly built to free the mobile bridge trains to rejoin the advance elements. In many locations combat roads had to be constructed in order to get units and particularly their trains across marshes bordering the rivers.

Except when actively conducting bridging operations, the engineers accompanied the trains during movement. This arrangement positioned the engineers to the rear of the attacking forces but

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avored movement of supplies and artillery to the battle. Few artificial obstacles were employed on the battlefields except for field fortifications - barbed wire appeared as the war wound down. Early in the war mobility demands differed little from those of the Mexican War except in the number of rivers that had to be crossed. The engineer units were tasked to get the armies to the battlefield where they largely maneuvered on their own. While engineer officers were busy organizing the terrain and developing attack/withdrawal routes, engineer soldiers built towers and command and observation posts on occupied rear lines to backup forward positions. Starting in 1863, both sides began to use field fortifications more extensively and engineers became increasingly involved in blazing routes to outflank enemy positions.

Engineer troops operated with their assigned units. Work on roads, bridges and the growing network of rails that was not directly associated with the current movement of the parent force was performed only when time, materials and technical capabilities permitted. Most engineer work outside the field army's immediate needs was done by contracted civilian workers under the direction of outside engineer officers. This was particularly true of the railway support that significantly augmented the use of waterways to supply large forces. Engineer soldiers hastily patched captured lines for immediate service but civilians crews pushed forward with the first trains to do the major work.

Engineer mobility warfare during the Civil War displayed several changes from previous operations. Engineer officers maintained their historic role to their commanders but the engineer units were more

numerous, more closely associated with the combat units, more directly committed to mobility and operated more intimately with the active fighting. Bridging operations accelerated to meet the demands of the field army and evolving reliance on railroads and field fortifications signalled future trends.

## WORLD WAR I

The high water mark for the engineer's share of the army came in World War I (WWI). At the war's conclusion there were nearly 300,000 engineers in the American Expeditionary Force (AEF) or roughly 15% of the american soldiers in France.<sup>4</sup> Engineers amounted to more than twice the standing army strength prior to the US declaration of war. This tremendous influx of personnel into the engineers removed most of the vestiges of the "craftsman" engineer force. Engineer units were filled from the same manpower that swelled the rest of the AEF. Engineer missions had changed along with the expanded labor force. Modeled and trained along the lines of the european armies, US engineers were responsible for all railroads and for newly developed technology such as searchlight operations. The war had made an enormous drain on european manpower by the time the AEF arrived and the army had to provide all services needed from its own resources. Civilian construction support to the forces in the field was minimal.

The battlefield had changed measureably since the US Civil War. The anticipated war of maneuver had quickly slid into the positional, entrenched battle of attrition that consumed thousands of men. The technological advances that made the space between two armies a "noman's land" also created the need to integrate more engineers. All four areas of support were expanded: survivability, counter mobility, general engineering and mobility. Trench warfare immediately brings the survivability role to the fore, despite the fact that this area changed the least from previous methods of employing engineers. Field

fortifications were at the top of the priority list of the army, but they continued to be constructed in the main by the infantry forces that occupied them. Only in unoccupied, secondary positions and key command posts did the engineers do more than their traditional role of sighting and supervising the work of others. General engineering support blossomed in magnitude to fill the void of civilian labor behind the front lines. While clearly the lower of the engineers priorities on the front, mobility and countermobility operations changed most significantly from previous wars.

Offensive operations in a greatly oversimplified sense consisted of getting sufficient combat power into the enemy's trenchline to overpower his forces. Marching exposed and shoulder to shoulder as at Gettysburg had been tried early on with the results for which WWI is infamous. Three approaches to solving the problem were tried: kill or suppress the enemy firepower prior to an assault; shield the attacking force from enemy fires; decrease the exposure time of the assault in the killing zones. The advances in artillery and chemical warfare came from the first approach, armored forces from the second and combat engineers in the assault echelon came from the third.

The missions given to divisional engineers preparing for an offensive demonstrate the increased breadth and intensity of the support given to assault units.<sup>5</sup>

- o prepare exits from own defenses
- o breach paths through enemy wire and obstacles
- o bridge trenches and obstacles for artillery
- o mark captured trenches
- o construct roads capable of animal transport forward
- o establish forward tramways for resupply
- o other duties (water, recon, build OP/CP)

In an attack, engineers clandestinely prepared lanes in their own obstacle belts, reconned and marked paths across noman's land and removed enemy cratering charges, wire and obstructions as the situation permitted prior to an attack. Preconstructed panels were carried forward with the lead elements to get infantry over saps and shell holes and demolitions (bangalore torpedos and satchel charges) were used to breach the final obstacles (Earlier in WWI, artillery alone was used to cut paths through wire and obstacles but had proved too unreliable - engineers increasingly became the primary breaching force). Armored and artillery support to attacks received special attention with heavier bridging and platoons of engineers dedicated to their rapid forward movement. Speed was essential to success: today's engineers would be hard pressed to better the performance of the 6th Engineer Regiment, 6th Division in constructing a timber trestle bridge for artillery over a 5 foot deep stream in 8 minutes - under fire. The regiment had to remain at the site and rebuilt the bridge several times when it was damaged by artillery.

Impressive as the above exploits may sound they need to be put into perspective. The number one mission for divisional engineers in an attack was movement of supplies to forward units. Routinely corps

and army engineers would move into the division area to free the divisional troops of rear area road, rail and tramway construction. The demands for logistical support to advancing units dominated all other engineer priorities. The 1st Engineer Regiment, 1st Infantry Division prepared to attack in the St. Mihiel salient by assigning one battalion to directly support the infantry, artillery and trains; the other battalion was charged with breaching both friendly and enemy wire and with the movement of supporting tanks. This arrangement only lasted for one day after which the entire regiment turned to road repair in the division area along with all corps and army assets available - clearly the logistical support requirements dictated engineer priorities. Engineers also supported offensives by serving as infantry, either in the assault to add weight or on flanks in an economy of force role. Engineer tactical mobility operations were not spontaneous actions but usually resulted from detailed preparations, planning and rehearsal - weeks were required to prepare the successful integration of engineers into tactical mobility.

The AEF engineer operations in WWI stretched the state of the art capabilities of the force. In an intense, high consumption conflict with limited resources, engineer mobility concentrated on logistical support at all levels. Habitually higher echelon engineers had to be moved into the division area to fill shortfalls. Survivability and countermobility tasks continued to be overseen by engineers and did not compete for engineer manpower. Lack of a civilian, trained manpower infrastructure placed enormous demands on army engineers - 77% of which worked outside the division area of operations on what had historically been contracted responsibilities.

## WORLD WAR II

Much of our present doctrine and planning estimates continue to reflect the lessons noted from WWII. As with WWI the US had not had to be ready to fight the first battle and win as had our European Allies in 1939. By the time that Americans actively entered combat in North Africa in 1942, we had had three years to study the "modern" battlefield demands. Engineers were to eventually make up the largest noncombat service in the army - 11% of total strength in Europe and 14% in the Pacific.<sup>6</sup> Even with all the advantages of time, resources and manpower, combat engineers learned by on the job experience in the European Theater. Amphibious operations, port construction, air support and the mechanization of forces all complicated the engineer missions. Mobility faced the same hurdles as in WWI in upgraded modes. Operational maneuver was a major factor in WWII while increased lethality of obstacles and weapon systems stood in the way of tactical freedom of movement.

Engineers were prominent in all zones of operation during WWII and most notably in the division and corps areas. While the efforts of near area engineer forces were significant, in all but the Pacific theater civilian labor once again took over a large share of the COMMZ work.

As a rule the US forces were on the offensive after 1942, making them a prime study for the employment of combat engineers in tactical mobility. Three campaigns of the European war highlight specific aspects of mobility support: the mediterranean operations, the

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breakout from Normandy and an excursion into the German side of the Battle of the Bulge.

The Mediterranean was the US' "first battle" in the European Theater. Following a near logistical disaster during the unopposed landings in Tunisia and the shakedown battles in the Kasserine Pass where engineers served as infantry, US forces went over to the pursuit of the withdrawing Germans. LOC construction and maintenance took top priority, with corps engineers moving forward to assist the divisional support units. The D-7 bulldozer set the pace for the pursuers as it cut and filled bypasses around the road blockages created by the Germans. Combat engineers at the head of each column encountered minefields that totally stalled their forward momentum. Ill equipped and untrained for mine warfare as conducted by the Germans, US engineers learned on the job as the enemy broke contact. Compounding their other problems, a shortage of tactical bridging for the numerous dry gaps that support vehicles had to cross limited the flexibility of the americans.

The Sicilian operations that followed the North Africa campaign continued the offensive problems encountered in Tunisia. Anticipating heavily obstructed beaches, each assaulting division landed with a corps engineer regiment assigned in addition to its organic engineer battalion. Few obstacles were found but engineers struggled to clear exit routes from the beachheads. Too few bulldozers were available to physically build the road net required to meet the logistic demands. As General Patton began his famous race to Palermo, engineers again faced numerous destroyed bridges and minefields in mountainous terrain. In a two week period the 1st Engineer Battalion, 1st

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Infantry Division by-passed over 40 blown bridges and craters. Mine clearing bogged down the combat forces advance and the D-7 dozer again set the pace for the advance by keeping up with the tanks as it filled in the gaps that the Germans had counted on requiring extensive bridging. The ability of the heavy dozers to keep up with the battle was as much a tactical surprise for the Germans as minewarfare was a setback for us. European armies did not have any equivalent capability and at a top speed of 7 MPH the D-7 kept up nicely with the spearheads.

Engineer support to the divisions was reduced to one additional battalion early in the advance but was quickly returned to a full added regiment to facilitate the multiple routes and flanking movements required to dislodge the opposition. Typically the lead division's own engineer battalion devoted two companies to route repair and one to mine clearing for the elements in contact. Corps engineers in the division area expanded the expedient work of the divisions to permit heavy combat equipment and logistic units to move forward. Tactical bridging demands continued to outstrip assets since planning factors had not recognized the need for multiple routes of advance in the offensive. When the war moved to the Italian mainland engineer mobility operations and their problems followed a similar pattern. Where a major problem such as a river or adverse weather confronted the advance, all echelons of engineers from division to army combined to keep the combat power supplied and moving - 10 miles in 10 days was not uncommon against concerted resistance.

Operation OVERLORD benefitted significantly from the amphibious experience gained during the Mediterranean campaigns. From a tactical

mobility and combat engineer perspective the landings highlighted how sensitive combined arms operations were to timing and coordination. Army, corps and divisional engineers (along with naval demolition teams) combined to lead the assault elements through the beach obstacle systems. Near disaster occurred on Omaha beach when the first wave of obstacle teams and infantry were stymied by German fires that should have been suppressed. The initiative of naval destroyers in suppressing enemy positions and the heroic actions of individual groups of soldiers to destroy key positions saved a very tenuous situation from failure. Movement of supplies into the beachhead and protection of the force were the priority engineer missions after the landings. When the allies moved to breakout of the Normandy area the engineers again turned to tactical mobility.

Hedgerows, canals and marshes limited the mobility of units in Normandy. Equipment such as the hedgerow cutting tank was improvised to lessen the vulnerability of the attacking forces but progress was painfully slow. Attacking divisions usually had an engineer regiment from corps assigned to support their movement. During the Cobra breakthrough operation three corps battalions in addition to the organic engineer battalion were committed to each lead division - one battalion supported the lead elements while the other two concentrated on opening the LOC in the division rear. Countermine operations were no more efficient nor effective than in the Mediterranean even though the US had acquired some of the British designed Scorpion tanks that used a mechanical flail to detonate mines. Division commanders trained their infantry and armor in mine clearing in order to sustain forward momentum. Canal crossing operations with treadway and Bailey

bridges were almost always successful when sufficient firepower was available to suppress direct fires on the crossing sites. The normal crossing required 2-3 times the material for a single bridge, however, because of the losses caused by enemy artillery. Since the Germans had registered their guns on most of the main routes in the area, secondary or pioneer roads served as the LOC and routes of advance for the divisions. Extensive mine clearing and reinforcement was needed along these routes to pass the motorized support elements through after the infantry and tanks had passed.

After the successful breakout of the allies from Normandy, the open terrain and disarray of the German units facilitated rapid pursuit. Most significantly the mine threat diminished markedly as we outpaced German emplacement capabilities and frontline engineers concentrated on LOC maintenance and bridging. Following the breakout, obstacles along the routes of advance were caused as much by the allied interdiction effort as by the retreating Germans. The presence of heavy earth moving bulldozers (D7) once again permitted forces to rapidly by-pass most damage. Road damage outside the immediate combat zone was so limited that engineers trained to maintain highways were retrained to repair the devastated rail system. Civilian labor forces quickly picked up the majority of the COMMZ road repair requirements while the military focused on reestablishing the ports, railroads, pipelines and forward LOC.

By the time that the Germans were moving forces into position for their last "deep battle" on the western front, US divisions were operating only with their organic engineers. Corps and higher level engineer units were committed to consolidating the LOC in preparation

for the winter operations ahead and only rarely acted in direct support of local offensives. Many corps units such as the 291st Combat Engineer Battalion that would become famous at Malmedy, Trois Ponts and Stavelot during the Battle of the Bulge were charged with replacing tactical bridges with more permanent structures. Shortfalls in haul capability to the frontline units required the engineers to operate their own lumber mills to produce the dimensional timbers needed. From a US perspective the Ardennes counteroffensive provided few insights into mobile warfare, but the German viewpoint has several similarities to how we picture our own operations on today's battlefield.

The Germans had fought a series of delays with local counterattacks all across France. They were facing certain defeat in a continued battle of attrition and their opponents could bring fresh forces to the battle that the Reich could not hope to match. The vulnerability of the allied forces was their logistic base. The German offensive struck to penetrate deep into the rear, destroy the support structure of the forward units and thereafter to mop up the remnants of the cut off combat power. Lack of air superiority and their own logistical problems made speed essential for success to the Germans and they organized their attack to punch spearheads into the rear of the Allies. The most infamous of these spearheads was Kampfengruppe Peiper belonging to the 1st SS Panzer Corps and given the mission to secure crossings on the Meuse River for its parent force. Breaking through the US lines behind strong infantry and engineer support Peiper showed initiative, agility and individual tenacity in his drive toward his objective. The shock of the initial

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breakthrough seriously disrupted the US defense and Peiper created panic throughout the rear of the US units - stopping barely long enough to massacre over eighty POW at Malmedy. Kampfengruppe Peiper was stopped on the 30 foot wide Ambleve River, the last natural obstacle before the Meuse. The river was fordable in all locations to infantry and armor, had three bridges over it along Peiper's route and was defended only by isolated elements of two engineer battalions, the 291st and 51st Combat Engineers. Peiper, however, had no engineer support with him capable of cutting down the steep banks of the Ambleve nor did he have any capability to repair the destroyed spans blown by the US engineers as he reached the existing bridges. US airpower, artillery and combat forces were subsequently able to react to his penetration and Peiper left all of his armor behind when his spearhead was forced to exfiltrate on foot back to German lines.

US forces and their engineers continued the assault on the Reich after the Battle of the Bulge and many heroic acts were performed along the way. The nature of the engineer support changed little, however, from the pattern developed across France. Tactical mobility remained the top priority for engineers in the division area, with the focus of effort usually on moving support units behind the advancing combat troops. Priority of effort within the forward divisions occasionally shifted to breaching particularly difficult obstacles such as the Siegfried Line and the Moselle and Rhine rivers but only when the LOC and logistic situation was considered to be manageable. Serious disruptions in a division or corps LOC received prompt attention from engineers at all levels.

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WWII in Europe was a tactical mobility war for the combat engineer to an extent never seen before in the US Army. While many engineers were committed to general engineering support of the theater, engineer focus remained on the forward battle and the logistic support immediately associated with it. Engineer priorities showed a definite trend towards the frontlines in times of stress. Early in the war mobility problems were identified with countermine warfare, inadequate stocks of tactical bridging and insufficient earth moving equipment in the divisions. By the end of the war the production capacity of the US had largely fixed the shortage issues with the D-7 dozer and the Bailey Bridge being proliferated throughout Europe. German officers after the war routinely expressed their frustration at the D-7's capability to eliminate obstacles and the seemingly endless bridging assets that exceeded German abilities to destroy by fire. Countermine solutions, however, never materialized to any significant degree and the best solution continued to be to commit more engineers forward along with universal countermine training of all combat soldiers.

The US was to relive the early WWII frustrations in tactical mobility again in Korea, only half a decade later. Combat units attempting to breakthrough the withdrawing North Koreans were repeatedly stymied by mine warfare and shortages in tactical bridging. Countermine warfare was the more serious problem since the campaign was conducted during the Korean dry season, making rivers fordable in many cases. An all out effort to produce bridging materials to upgrade the LOC before the rainy season took six months before assets

arrived in theater. Mine warfare, however, continued to upset US mobility throughout the war.

## CONCLUSIONS

As noted in the introduction to this study, the utility of an historical review is in the insights that can be gained into issues that face today's commanders. With the exceptions of the two early wars against Great Britain in 1775 and 1812, our army has been offensively oriented. Even in WWI, a tremendous defensive struggle, the AEF missed most of the stagnation and entered the fight in time to join the concluding offensives in the West. Two major trends come through concerning the engineer's role in tactical mobility operations:

- o Line of communications in the Corps/Division area have top priority on mobility efforts whenever resources are constrained at the front.

- o Engineer presence and their role in tactical mobility have consistently increased as the battlefield has become more lethal and artificially structured.

Several corollaries stem from these trends and help to relate the historical lessons to the characteristics of AirLand Battle: flexibility, decentralization, dispersion, speed and fluidity. The primacy of LOC support over direct movement of combat forces has meant that there had to be a surplus of forward located supplies or of engineers in order to sustain offensive freedom. As obvious as the need for adequate logistics is to sustained operations, it is worth

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noting that engineers have routinely been weighted forward to maintain all the ALB freedoms of action and then withdrawn to the LOC at the expense of the lead elements whenever a decline in logistic support occurred. The overall impact of the reduction of engineers in the fore of the attack has taken two routes. If the initial attack has overcome the enemies ability to create manmade obstacles then the deep battle continued at the intensity supported by the LOC effort. If, however, the enemy has maintained an ability to artificially structure the battlefield then our momentum slowed or halted while we have waited for the regeneration of engineer mobility support.

The need for more engineer effort has been resolved many ways.

- o In WWI we physically increased the number of engineer units.
- o Non-engineer soldiers have been trained to do engineer tasks. (Interestingly the trend is heavily away from this solution - declining precipitously from the Revolutionary War when infantry did most of the effort)
- o Lastly, civilian labor has periodically been employed in rear areas to free military engineers for frontline duties. Today's Host Nation Support emphasis is a renewal of this technique but the historical trend has been for civilians to work ever further removed from the frontlines and for military units to be retained or diverted for "critical" functions.

The second insight of engineers and mobility - increased numbers of engineers to cope with increased artificial structuring of the battlefield - is another of the obvious observations that has more

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depth than is self-apparent. The impact of increasingly sophisticated technology on war has been a driving factor in the expansion and specialization of engineer units, but that is not the critical factor in relating the historic trend to today. What is key is the fact that we have consistently underestimated the demands of the next battlefield in our interbellum planning and training and have been slow to redress the disconnects once identified. Our failure to recognize the needs for multiple axis of attack, redundant bridging components and countermine capability in WWII compounded the engineer shortage as ad hoc fixes diluted coordination of available assets.

ALB stresses tactical mobility to maintain the flexibility essential to defeat a numerically superior enemy. To gain that freedom of movement, today's commander must ensure that his mobility capability can overcome the countermobility effects he will face. Historically we have achieved the advantage more by eliminating the enemies capability to stop us than by increasing our ability to reduce his obstacles - the drive across France in WWII for example. The realities of history suggest the following questions for the commander and his engineer to address prior to any attack to filter and focus the decision making process.

o What obstacles to movement must be overcome?

- Do we know where our own decentrally emplaced obstacles are?

- What has the enemy done? How many POZ (mobile obstacle teams) does he have available? Does he still have an artillery delivered mining capability?

- o How fast must we achieve our objectives?
  - When can the enemy react effectively against us - artillery, air, ground?
  
- o What mobility support do we have?
  - How fast can we clear mines?
  - How will we cross gaps? How many can we cross? How redundant is our capability?
  - How fast can the support move?
  - What is the status of mobility training for non-engineers?
  
- o What is our logistics situation?
  - When will we need resupply?
  - How will we be supported?
  - Who will open/maintain the LOC?
  - How do we maintain momentum if engineer priority shifts to the LOC?
  - Can host nation support be used to free engineers?

The questions are basic to a military estimate of the situation and more importantly the frank assessment of the answers has been historically shown to be key to success. It is not the purpose of this analysis to postulate on the US ability to execute the doctrinal concepts put forth in ALB, but it is worth pointing out that in every aspect of tactical mobility the Soviet Army has taken direct action to

ensure the answers to the above questions are favorable to them. The words in FM 100-5 provide an upbeat guide to what the US Army needs to do to come as we are, fight the first battle, seize the initiative, win and other too easily said phrases. We now must answer the questions. They provide focus from the experience of history and ultimately our ability to answer positively will determine if ALB is to be a panacea or a placebo.

## ENDNOTES

1. "Engineer Operations in Past Wars", The Engineer School, Ft. Humphreys, VA., 1926, p. 17.

2. Ibid., p. 17.

3. " 'Dear Friends at Home...' , The Letters and Diary of Thomas James Owen, Fiftieth New York Volunteer Engineer Regiment, During the Civil War", Prepared by the Historical Division, Office of the Chief of Engineers, US Government Printing Office, Washington, DC., 1985, pp. 9-11.

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