Engineers, Where Do We Go From Here?

By Lieutenant Colonel Kevin S. Lindsay

This article is intended to stimulate thought and discussion on possible future directions for engineers. Although the article does not necessarily express an official Engineer School position or proposal, the author proposes some actions that might allow us to meet Chief of Staff of the Army General Eric K. Shinseki's vision. The author also illustrates possible future engineer organizations that would be more in line with that vision.

Although engineers remain respected and valuable members of the Army team, it seems we are continually losing key force structure and modernization battles. The armored combat earthmover (ACE) took so long to get fielded that even when it was new, it was already a generation behind other members of the mechanized team. We may still win the fight over the heavy engineer-brigade headquarters, the Wolverine (see article, page 21), and the Grizzly, but the fact that their future is uncertain tells us that many key people in the Army see higher priorities out there for people and dollars.

While we have been struggling to deal with long-standing equipment and organizational problems, Army downsizing has added a new set of problems. We've had to make tough decisions on which units to eliminate or move to the Reserve Component (RC), and we've suffered from the same "salami slicing" (taking a little away from all units to avoid cutting more units) as the rest of the Army. So we've reduced many engineer squads from ten to eight soldiers and steadily reduced support personnel. Units often respond to the latter by detailing soldiers from line platoons into support positions. Many units, even when they are at 100 percent strength, are not as capable as they were twenty years ago.

Review Roles and Missions

So what do we do? How can we not only maintain our current capabilities but actually increase our abilities to support the Army in an era of changing missions, shrinking budgets, and reduced personnel levels? We know that we can't simply dig our heels in to hold on to those systems and structures we've fought for based on the "Cold War Army." While we might win in the short term, in the long term, any system or structure that doesn't support post-Cold War realities will become a bill payer for those that do. It's just a matter of time. *What we must do is identify where the Army is going and what it needs its engineers to do.* We need a total review of our roles and missions and a top-to-bottom review of our units and our command-and-control (C2) structure.

The Army Vision

Realizing that we're not likely to get more money and more people, we have to ensure that we're focused on doing those things that the Army needs most from its engineers. General Shinseki's vision for the Army includes the following:

- **Strategic dominance**. Dominance at every point of the spectrum—from humanitarian assistance and disaster relief, to peacekeeping, to major theaters of war.
- **Responsive**. Quick deployment, over long distances, with sustained momentum.
- **Deployable**. Combat forces capable of going anywhere in the world—a brigade combat team (BCT) in 96 hours after liftoff and a division in 120 hours.
- **Agile**. Forces capable of transitioning quickly from stability support, to warfighting, and back.

- **Versatile**. Units able to fight at any point on the spectrum of operations with minimal adjustment.
- **Lethal**. Every element in the warfighting formation capable of generating combat power and contributing decisively to the fight.
- **Survivable**. Maximum protection at the individual-soldier level.
- **Sustainable**. Reduced logistics footprint and replenishment demand.

The Army's move to create "medium" maneuver forces and the discussions on making heavy forces more deployable and lighter forces more lethal are due to the recognition that we will likely have to move to the fight. Hopefully, if we can move fast enough, we can win the war before it starts by stabilizing a region or reinforcing a weaker ally to the point that an aggressor decides not to attack. If war does break out, then we want to deploy overwhelming combat power quickly to defeat an enemy with minimal loss of friendly forces. Once active combat ends, we must be able to transition to peacekeeping and stability operations. Key engineer considerations for these operations will include the following:

- Construction projects will support civil and military infrastructure to help deter aggression and strengthen a friendly government. Engineers are unique in their ability to provide highly visible assistance to a friendly nation and show U.S. support in a nonagressive manner. Active and reserve construction units have been successfully doing this for years. Airborne and light corps battalions (which are really medium battalions with a great deal of engineer equipment) give us the capability to deploy for these types of missions quickly by air.
- Engineers deployed for nation assistance may also assist in the buildup of U.S. combat power and play a key role in subsequent combat operations. *Versatility is a must.*
- Dynamic obstacles—such as the Volcano, Hornet/Raptor, and Modular-Pack Mine System (MOPMS)—and future scatterable mines will be key if enemy forces engage light and medium forces that arrive early. Dispersion of forces will hinder the emplacement of labor- and time-intensive conventional obstacles.
- Survivability support to light and medium forces could be key because they will not have the heavy armor of the Abrams tank and the Bradley fighting vehicle.
- Support to aerial ports and seaports of debarkation and road networks will be key to the rapid buildup of forces. As potential enemies learn to deliver chemical agents, mines, and conventional munitions deeper and more accurately, our ability to use established airfields and ports will be threatened. We must have the ability for airborne insertion and landing at small, austere airfields. We also must be able to bring in logistics over the shore.
- In-stride breaching (breaching obstacles without dismounting and stopping the maneuver force's momentum) will be key for forces on the attack.
- Air-assault operations will play a greater role as medium formations are created that can be rapidly moved by the joint tactical rotorcraft (JTR) and its planned 20-ton lift capability. These operations will allow engineers to provide rapid mobility support without having to move as part of the maneuver formation. This should be especially true for bridging and small earth-moving operations, where we've actually lost air-assault capability since Vietnam.
- Maneuver forces will still want well-maintained supply routes from the aerial ports or seaports of debarkation to the battalion trains. While future forces will make maximum use of the JTR, commanders will not want to be limited to aerial resupply. A force with such a limitation would be open to catastrophe if the JTR was grounded due to a new enemy air-defense system or some unforeseen weather condition.
- Enemy forces will rely more on their own dynamic obstacles and will gain improved capability to deliver scatterable mines and other munitions on our supply lines. Similarly, they will gain in their abilities to destroy point targets, such as bridges, along our supply lines.
- Dispersion of forces will lead enemy defenders to rely less on labor- and equipment-intensive obstacles such as tank ditches and conventional mines once combat is initiated. Instead, they will reinforce natural obstacles and make maximum use of rapidly delivered scatterable mines.
- We still will encounter heavy use of conventional mines and obstacles in peace enforcement and small-scale contingencies where factions have had months and years to place obstacles.

Recommended Changes

To better meet these future engineer requirements and to address the challenges brought on by aging equipment and the Army's downsizing, we should consider the following when developing our modernization plan:

1. Minimize our organic/normally associated footprint in maneuver formations (battalion task forces).

2. Focus on our unique capabilities to meet future maneuver-force requirements.

3. Simplify engineer C2.

4. Examine and redefine the role of the combat-engineer squad in support of mounted formations.

5. Ensure that we have robust (strong, healthy) engineer units at the execution level.

6. Integrate Active Component (AC) and RC engineers.

7. Improve equipment by going after high-payoff, low-cost developments and modifications.

The following paragraphs elaborate on each of these seven areas. The intent is to stimulate thought—not to criticize past efforts or to imply that these are the only ways to move forward. As anyone who has ever worked a decision-making process or

other problem-solving technique knows, the best solution is usually one that emerges during the analysis of several distinctly different courses of action.

1. Minimize our organic/normally associated footprint in maneuver formations (battalion task forces).

As we look to the future, our first challenge is to define the engineer-support requirements for maneuver formations whose capabilities are still being developed. Many assumptions are being made about the mobility, countermobility, survivability, general-engineering, and topographic-support requirements of future forces. Most of these assumptions are toward minimizing engineer-support requirements through revolutionary weapons or logistics technologies.

The Army's goal is to minimize the need for specialized units such as engineer, air-defense, and fire-support teams that must move with the maneuver formation. The logic in this is simple and not really new: All of these specialized forces must be carefully maneuvered to be at the right place at the right time. Not only does this complicate the maneuver commander's job, but these forces also must be deployed in large numbers to ensure that they are there when needed. As a result, the normally associated mechanized engineer battalions that support each heavy maneuver brigade significantly increase the lift necessary to move the brigade. However, they often find themselves underemployed while moving with the brigade (for example, after the initial obstacles were breached in Desert Storm). And, they lack the versatility to support reception, staging, onward movement, and integration (RSOI), bases, and combat-support and combat-service-support (CS/CSS) operations. As a result, we often find ourselves with excess "assault engineers" and are forced to take up more critical lift to move echelon-above-division (EAD) engineers to support RSOI, bases, and CS/CSS operations.

In reality, the Army has already adopted this recommendation and currently plans to put only a small company in the medium interim brigade combat team (IBCT). While the exact size of the company may change, it seems unlikely that future divisions will have an engineer battalion to support each ground maneuver brigade. This may seem like a bad decision to some, but it probably is a reasonable one. If we can keep our normally associated footprint small, but capable, we can build more versatility into the division as a whole by creating a second divisional combat battalion that is not normally associated. This battalion could have the versatility to support a broad range of combat, RSOI, base support, and CS/CSS operations. As the remaining recommendations will point out, we can follow the Army's lead on this and create more versatile, agile, and deployable engineer organizations with companies instead of battalions as the normally associated engineer force supporting a maneuver brigade.

2. Focus on our unique capabilities to meet future maneuver-force requirements.

Currently, combat engineers spend a great deal of time performing labor-intensive tasks that others could do. Concertina obstacles and fences are general battlefield tasks that all soldiers should be able to do—just like digging a fighting position. If we spend great quantities of man-hours (which we are) erecting wire obstacles and fences (including fratricide fencing), then we are providing unskilled labor. Others could perform this labor, but they don't—because they have more important jobs to do. This puts us at a severe disadvantage in the prioritization fight. We also should avoid pursuing force structure for scouting and forward reconnaissance missions for maneuver forces. Instead, we should be able to attach experts to the scouts for engineer-specific reconnaissance. We should also continue pushing rapid topographic support and terrain analysis to units. These are unique engineer capabilities.

Other future requirements that we are uniquely capable of supporting include the following:

Maintenance and repair of main supply routes (MSRs). This mission will be even more important on a widely dispersed battlefield against future enemies that can attack our MSRs with long-range precision munitions and scatterable mines. While the future JTR promises reduced reliance on ground MSRs, few commanders will want to be totally reliant on air resupply for very long. Even in Vietnam (a classic light-infantry/air-assault war), MSR maintenance and repair were major engineer missions. Unfortunately, there is general confusion over whether MSR maintenance (to include bridging) is a mobility or general-engineering/sustainment task. Field Manual (FM) 5-101, *Mobility*, clearly focuses on mobility support to ground maneuver forces—infantry and armor. Bridging and road maintenance and repair, which could be key to a maneuver task force's mobility, are currently considered general-engineering tasks and are covered in FM 5-104, *General Engineering*. When senior leaders talk about mobility, they are often including mobility of unit supplies along the MSR. We have not done a good job of articulating the importance to the Army of maintaining supply routes in the task-force, brigade, and division areas. Articulating the importance of this mission, and fighting for equipment to perform it, will be key to getting the right engineer force to support it in the future. We should start by moving MSR maintenance and repair and bridging out of the "general-engineering" category and include them in "mobility."

Support outside of the maneuver brigades—brigade support areas (BSAs) and aviation, corps artillery, air-defense, and CSS units. As part of the Engineer Restructure Initiative, we put a battalion for each maneuver brigade in the heavy division. These battalions have little sustainment-engineering capability. They lack the versatility to support stability operations (which typically require general engineering) or to support force-buildup operations. This means that corps engineers must deploy early to support stability operations and force buildup. This lack of versatility in heavy-division engineers also means that there are no divisional engineers to support anyone outside the maneuver brigades. (In reality, there are very few engineers to support anyone outside the maneuver task force.) We currently rely on corps engineers to support BSAs, MSR maintenance and repair, aviation assembly areas, towed-artillery survivability, air-defense artillery, CSS units in the division support area, and bridging

beyond the armored vehicle-launched bridge (AVLB). The units in question don't need just mechanized engineers—they also need equipment for survivability berms and trenches, leveling ground for support areas, dust control, and simple construction support for bunkers and basic quality-of-life projects. Future structures should correct this lack of versatility in the division's organic engineers. This would enable the division to execute a broader range of missions without corps engineer augmentation—making the division more responsive and deployable.

Minefield clearing and unexploded-ordnance (UXO) disposal. We have said loud and clear that demining and UXO removal are not our missions. We focus almost exclusively on assault breaching of minefields. We may have said this out of fear of becoming bogged down and exposing our troops to unnecessary danger. However, this is very shortsighted on our part. Minefield clearing and obstacle reduction (removal as opposed to breaching or bypassing) are engineer mobility tasks per FM 5-101. Artillery, air- and ground-delivered scatterable mines, and cluster bombs lead to a very dirty battlefield. Enemies increasingly will be able to place scatterable mines on MSRs, airfields, bases, and previously breached minefields. Even if they cannot place direct or indirect fires on these, they will pose a major obstacle on our supply lines if we cannot clear them quickly. Explosive-ordnance-disposal personnel cannot perform these missions alone. We should have the equipment and tactics, techniques, and procedures (TTP) to detonate large numbers of surface-laid or shallow mines/UXO. By taking advantage of our demolition skills and the systems already developed, we could greatly enhance our divisional and corps engineers' ability to safely detect and clear UXO along MSRs, within potential bases, and from assault and helicopter landing zones.

3. Simplify engineer C2.

We should simplify our C2 structure and align it better with supported maneuver units.

Discontinue either brigades or groups. Eliminate one level of C2 and produce a flatter organization that can take advantage of digital information systems. Each division (heavy, medium, and light) should have one brigade/group, and each corps should have one. There should also be some number of brigades/groups for the theater rear. These headquarters could be multicomponent with a mix of AC and RC subordinate units. This would allow a smooth transition from peacetime training, to deployment, to combat/peacekeeping, to redeployment. Each of these brigade/groups (including divisions) should have some type of construction-management section (most would be predominately RC) that would perform drills and annual training with the unit and go to war with them. The RC groups and brigades (15 groups and 4 brigades currently in the structure) could be combined with AC groups and brigades to provide each division and corps with a group. Construction-management sections could be fairly small, utilizing the U.S. Army Corps of Engineers to support any heavy design or highly technical requirements.

Use the same basic engineer C2 structure for heavy, medium, and light forces. Currently, we have heavy divisions with O-6 engineers (we may convert this to an O-6 staff engineer without a brigade headquarters), O-5 brigade engineers, and O-3 task-force engineers. Light, airborne, and air-assault divisions have O-5 engineers, O-3 brigade engineers, and light task-force engineers (one level lower than heavy divisions). The new medium brigade is expected to have an O-5/O-4 engineer with just one organic company. Currently, due to lack of sustainment engineers, all divisions would likely receive large corps augmentation (three to five battalion equivalents) depending on their priority. We try to assign a group to all types of divisions that receive significant corps augmentation.

To provide consistent engineer C2 and a smooth transition during contingencies, we should apply the following recommendations to all maneuver divisions and brigades:

- Assign an O-6 group engineer as the division engineer for all divisions.
- Provide a robust group staff to support division tactical (DTAC), division main (DMAIN), and division rear (DREAR) command posts with a minimum of a major, a captain, and two NCOs for each command post (DMAIN would be larger, of course) without pulling the group XO, S1, or S4. The DREAR should also have a construction-management section.
- Provide an O-4 staff engineer (supported by a captain or first lieutenant, and two NCOs) for each maneuver brigade and the aviation brigade.
- Provide liaison teams (staff sergeant and specialist) for engineer platoons to assist the task-force engineer platoon leader. If trained properly, these teams could assist platoon leaders during planning and then track scatterable mines, other obstacles, and mission status during execution. This would allow platoon leaders to focus on leading their platoons in combat.

Reduce the types of corps battalions. Corps battalions must be versatile—capable of both combat and construction missions. The current combat-heavy battalion with its six vertical-construction platoons is difficult to employ efficiently once combat starts (except in and around rear-area bases). The Army is attempting to reduce our deployed footprint by maximizing use of host-nation and contract engineers. This plan directly threatens the need for our current number of combat-heavy battalions (42 active and reserve). Similarly, corps mechanized battalions (14 active and reserve) have almost no capability to maintain and repair MSRs or to support rear-area bases.

A more efficient system would be to convert current combat-heavy, corps wheeled, and mechanized battalions to multifunctional combat/construction battalions. Separate horizontal, vertical, and bridge companies would then be attached to these multifunctional battalions based on the mission, enemy, terrain, troops, and time available (METT-T). Each battalion—consisting of three line companies with one horizontal platoon and two combat platoons each and a vertical

platoon and construction management section in the headquarters and headquarters company (HHC)—could work anywhere from the brigade area to the theater rear. This would reduce the amount of task-organization changes to a bare minimum.

Note: The separate companies mentioned above must be able to break out platoons similar to the way prime-power platoons can be deployed from the company. In peacetime, these separate numbered companies would be assigned to a multfunctional battalion as a fourth company. (This is commonly done with current combat-support-equipment [CSE] and light-equipment companies.)

4. Examine and redefine the role of the combat-engineer squad in support of mounted formations.

Mounted maneuver commanders have been saying for years that they want their engineers to do two things: conduct in-stride breaches and create dynamic obstacles. This simple request poses several issues for engineers to consider:

- The need for organic or normally associated combat-engineer squads to meet these two needs will continue to diminish. Mounted maneuver units need breaching and mine-laying equipment with well-trained operators—not a squad that dismounts to breach or place obstacles by hand.
- We must continue to develop equipment and TTP that enable mounted engineers to perform required mobility tasks using the vehicles they operate (and that protect them).
- We are maintaining unnecessarily large engineer assault elements because of our desire to keep military occupational specialty (MOS) 12B (combat engineer) squads for mobility/countermobility support in mounted units.

Therefore, for mounted forces, we need to look at our assault engineers primarily as vehicles/equipment fighting as part of a mounted formation—not as transporters of dismounted engineers. Doctrine for medium forces is still being developed, but so far it seems that the medium brigade will be infantry-heavy and move in an armored personnel carrier. Again, it seems that equipment to allow rapid movement by these personnel carriers would be more important than the ability to dismount large numbers of engineers. Dismounted infantry can perform many of the same tasks that dismounted engineers would perform. What the infantry probably can't do is conduct in-stride breaches, create dynamic obstacles, and clear rubble/demolish buildings in military operations in urban terrain without engineer-equipment support. The objective force of 2020 to 2030 will rely on specialty units (such as engineer, fire-support, and air-defense) as little as possible. Rather, the capabilities that these elements currently bring to the task force will be built into the maneuver force's vehicles, equipment, and personnel to the maximum extent possible. This further underscores the need to focus on doing those things that only an engineer can reasonably do.

Future engineers who are organic or normally associated with a maneuver force should therefore be very equipment- focused. This equipment must have two operators per vehicle for 24-hour operations. (Why take critical air- or sea-lift space for a piece of equipment if we cannot operate and maintain it 24 hours a day?) The intent here is not to diminish the importance of combat-engineer squads; they remain critical because of their versatility. They allow the combat platoons to be versatile by conducting operations such as route-clearance, obstacle-reduction, and area-clearance after a breach; constructing culverts, bunkers, bridging, and lodgments; providing rear-area security; and fighting as infantry, when necessary. It does seem that 12Bs have lost some of their versatility over the past twenty years. We've significantly reduced the sets, kits, and outfits (SKO) that they carry. Perhaps this is due in part to the reduction to eight-man squads. This trend must be reversed because it clearly goes against General Shinseki's vision of more versatile units.

5. Ensure that we have robust engineer units at the execution level.

We should ensure that units are robust enough to complete missions even when they are short up to 20 percent of their personnel due to peacetime shortages (leaves, transitions, schools, special duties, support details) or combat losses.

Return to ten-man squads. In going to eight-man squads, we have assumed away too many real problems and reduced the squad's versatility (counter to General Shinseki's vision). When the squad dismounts, it must leave a driver (a "shotgun" is also required in many cases) with the vehicle. In peacetime, profiles, personnel transitions, leaves, schools, special duties, and support details (internal and external) mean that an eight-man squad will be short even if the unit is manned to 100 percent on paper. Also, with only five junior enlisted soldiers (including the vehicle driver), the squad has little opportunity to cross train soldiers on construction and the use of special equipment or tools. These same problems will continue in combat; plus, we may have battle casualties.

Man platoon, company, and higher headquarters with sufficient drivers and support personnel to avoid detailing them from squads. Another drain on our squads is that we have allowed modified tables of organization and equipment (MTOEs) to be made that do not provide sufficient drivers, mechanics, and support personnel. Every vehicle must have a dedicated driver; engineer equipment should have two drivers for a 24-hour operation. We need to look at each unit and put the positions on the MTOE to prevent squads and sections from being raided for drivers and mechanics. The same is true for other critical support personnel such as supply; communications; nuclear, biological, and chemical; and armorers.

6. Integrate AC and RC engineers.

We should truly integrate AC and RC units, taking advantage of each other's strengths, especially in headquarters, construction management, and sustainment engineering. The robust structure that we need to command and control organic

and reinforcing corps engineers and maintain lines of communication can only be reached if we integrate RC engineers into active divisions.

Construction-management is a prime example of a function that could be performed as well or better by RC personnel. A small active-duty section would be augmented by RC soldiers on weekend drills, during annual training, and when deployed for combat. These RC soldiers often bring technical skills beyond what we can reasonably expect in the AC. Also, some of the units in the division could be RC. To be integrated, the AC will need to make some adjustments. For example, a multicomponent unit will have to designate one weekend a month for training, with two designated comp days shortly thereafter. This may sound silly, but it's a major issue when an RC unit wants to train with an AC unit. Often, the AC unit looks at the training as yet another weekend in the field and says no unless it was already planning to be in the field. AC units tend to expect RC units to adjust their schedule to meet the AC schedule. However, this isn't practical because RC units try to lock in their 39 training days a year out, versus six weeks in AC units. Multicomponent training should be routine and predictable; for example, AC units could plan that "the third weekend of every month, we will train with our RC units."

7. Improve equipment by going after high-payoff, low-cost developments and modifications.

The recent cuts in the Grizzly and Wolverine programs illustrate how difficult it is to get major systems fielded—even when they are fully justified. Maybe we can go for lower-cost systems that take advantage of commercial technology, make current systems (such as the Palletized Load System [PLS]) work for medium and light forces, and look at improvements to current systems.

Air-assault and air-transport capabilities. Air assaulting engineer equipment to where it is needed is a critical engineer force multiplier that was used very well in Vietnam in support of both light and mechanized forces. The JTR will be able to transport 20 tons. We should now start planning to procure equipment that will take advantage of this capability. For example, there are D6 dozers that weigh less than 20 tons. With D6s that compare favorably with current D7 capabilities, does it make sense to rebuild/replace the D7 fleet–or should we begin transitioning to a D6? The later would seem the obvious choice. Similar decisions can be made for most of our engineer equipment. The capabilities of the C-17 and JTR should allow our medium forces to possess capabilities that rival our current heavy engineers, thus enabling our heavy and light organizations to be merged into medium units in keeping with General Shinseki's vision for the objective force.

Future Combat System-Engineer (FCS-EN). Divisional and EAD combat engineers should move in the FCS for force protection. We should be working with the Army to ensure that the FCS has as much mobility capability as possible. The following options should be pursued for the FCS-EN (priority as listed):

- A small bulldozer blade. This blade could be used to dig in, breach, clear rubble, and receive attachments such as a mine roller or plow that rests on the ground to reduce stress on the blade arms.
- A demolition round fired by all FCSs or an FCS-EN.
- A simple heavy-duty grapnel hook that could be fired from the FCS and then mechanically retrieved to cut barbed wire and detonate trip wires.
- Hydraulic and electric tool connections similar to the capability of the current hydraulic-electric tool outfit (HETO) trailer.

These items should be included in all FCSs, as much as possible. If they cannot be, then an FCS-EN should be developed. The capabilities of FCSs versus an FCS-EN or other future combat-engineer vehicle will largely determine the requirements for engineers in the maneuver-task-force formation.

Integrated trailers. We need to take a hard look at our trailers. By upgrading them for use with standard Army prime movers, such as the interim fighting vehicle (IFV)/FCS and family of medium tactical vehicles (FMTVs), we can increase our capabilities at an economical cost. Items such as the new hydraulic tool trailer are a step in the right direction, but we can do more.

Mechanized engineers lost the earth-moving capability and versatility provided by a dump truck in order to improve their survivability. Current thinking is that there may be no engineer variant of the IFV and possibly none for the FCS. It would therefore be a tremendous asset to have a highly mobile trailer that could dump 3 to 5 tons of material. Mine/countermine sets, demolitions, and SKO could be stored in an insert that is easily dumped and retrieved using some type of mini-PLS. Additional features of this trailer should include the ability to "daisy chain" trailers so that one prime mover can pull more than one trailer and a quick disconnect system that allows drivers to disconnect trailers without leaving the cab. These two features, combined with the ability of the medium PLS (described later) to transport two trailers at a time, would allow trailers to "catch up" with elements that have dropped trailers based on METT-T. When combined with the following two inserts, this system would give us tremendous versatility and agility to perform both combat and construction tasks:

- **A mine/countermine insert.** It should contain a Ground Standoff Minefield-Detection System (GSTAMIDS) and other future detection and detonation equipment for use in conjunction with the dump trailer. Optimally, the dump trailer could be attached to the blade on the FCS-EN for mine-clearing operations. In this mode, weight (dirt) would be added to the trailer to make it heavy enough to stay on the ground when a mine is detonated. *Note: Many scatterable antitank (AT) mines are relatively small shaped charges that would do little damage to a trailer filled with dirt.* The GSTAMIDS or other future system could be mounted and suspected mines detonated.

Filled with dirt and equipped with proofing wheels, the trailer would then proof the cleared area in advance of the FCS.

- **An integrated skid steer with tools and attachments insert.** (See article, page 22). With special boxes for hydraulic tools and attachments, the skid steer can load dump trailers, FMTV dumps, and PLS dumps. While the skid steer's bucket is small, the loading speed on many smaller jobs is not critical. The skid steer can go places that small emplacement excavators (SEEs) and bucket loaders cannot go, and it is also easily air assaultable. This integrated piece of equipment, tools, and trailer could be deployed and pulled by anything from an IFV/FCS to a 5-ton truck. With the skid steer, combat engineers could efficiently perform a variety of combat tasks (such as obstacle and bunker construction) and sustainment tasks (such as road repair and vertical construction).

Medium combat-engineer vehicle (MCEV). This item is based on an assumption that we will be able to develop a more capable and survivable combat breacher than the FCS-EN if we limit the crew to three. The smaller crew should enable a lower silhouette, more armor, and a more capable breaching blade. This vehicle should have a blade on the front similar to the Grizzly, a demolition gun, and the same heavy-duty grapnel as described above for the FCS-EN. Deleting the Grizzly's bucket arm should reduce the weight and cost.

Bridge sets. We need a variety of bridge sets that can be rapidly deployed and placed by non-bridge units. With the IFV/ FCS being Class 20 or less, we should be able to produce an air-assaultable bridge that could be placed directly over small gaps (reducing requirements for future medium AVLBs) to cross the IFV/FCS. In fact, this was done in Vietnam with M4T6 dry spans. We should also have air-assaultable piers for these bridges to allow multiple sections to be air assaulted in to span larger gaps. This bridge system could be placed by any engineer unit (site prep by an air-assaultable blade would often be required) and greatly reduce the requirement for specialty bridge companies. *Note: A version of this bridge could be developed for launching from a PLS module.*

Automated fence and marking system. It currently takes more man-hours to mark scatterable minefields than to emplace them. We should be able to come up with some type of rapid marking system that can be attached to a high-mobility, multipurpose wheeled vehicle (HMMWV), a SEE, or a truck to eliminate having 12Bs hand-emplace fences. This system should also allow for some type of antipersonnel obstacle similar in effect to triple-standard concertina wire**.**

PLS for light and medium forces. Current PLS dump (12 cubic yards), water-distributor, and concrete-mixer modules appear to be easily modified for air deployment because they can be broken down from their prime mover. We need a lighter version of the PLS that can haul 20-ton engineer equipment– such as D6s, loaders, graders, and deployable universal combat earthmovers (DEUCEs)– Class IV, and current and future PLS modules. An example is a 5- or 10-ton tractor that could pull a trailer capable of loading and off-loading PLS racks and able to haul equipment/Class IV when no rack is loaded.While this seems like a lot, it should be doable with rollers and a wrecker-like system attached to the tractor. *Note: The current PLS can haul two racks–one on the prime mover and one on the trailer. This system would only haul one on the trailer.*

The main difference between light and heavy horizontal engineers is their earth-moving capabilities. A 12-cubic-yard (14 cubic yards with sideboards) dump truck would be a tremendous improvement. Light units' graders, loaders, and dozers/DEUCEs are already ideal for most MSR maintenance missions. Using PLS technology would also reduce development costs because heavy, medium, and light units could use many of the same systems. As later structure discussion will show, a medium PLS will provide tremendous capability, versatility, and agility to future forces.

An improved mine-clearing line charge (MICLIC). It should be survivable and simpler and capable of being pulled by a variety of vehicles. The currently planned Mongoose system should provide this capability.

Note: As we move to make ourselves more versatile, we will encounter significant training challenges. As a result, future systems should be designed to be as simple to operate and maintain as possible. This and ensuring that squads and platoons are properly sized are really the keys to versatility. We can also develop innovative training strategies, such as using civilian technical colleges and two-week courses at Fort Leonard Wood or other installations, to take some of the training burden off the units. It is typically the leaders' inability to train soldiers on a wide variety of equipment, rather than the soldiers' ability to learn, that limits what our units can do.

Possible Future Structures

The Army has developed its modernization strategy to reach its objective force as shown in Figure 1. While we sustain and recapitalize selected "legacy" forces, we will concurrently develop interim medium brigade combat teams and interim divisions. We will take advantage of current science and technology (S&T) for our interim forces and future research and development (R&D) to reach our objective force. This objective force will have the same or greater firepower and survivability as current heavy forces but will be much lighter and deployable, using 20-ton vehicles versus the 70 tons of today's M1 main battle tank. As the objective force is fielded, legacy and interim forces will be transformed into the objective design. Engineers can best support this plan by utilizing the seven recommendations previously described. Based on this, I recommend that we look at doing the following:

1. Field assault companies for the IBCTs (now to 2002). (See assault battalion in Figure 2.) While this organization is larger than the company currently proposed, the three assault and

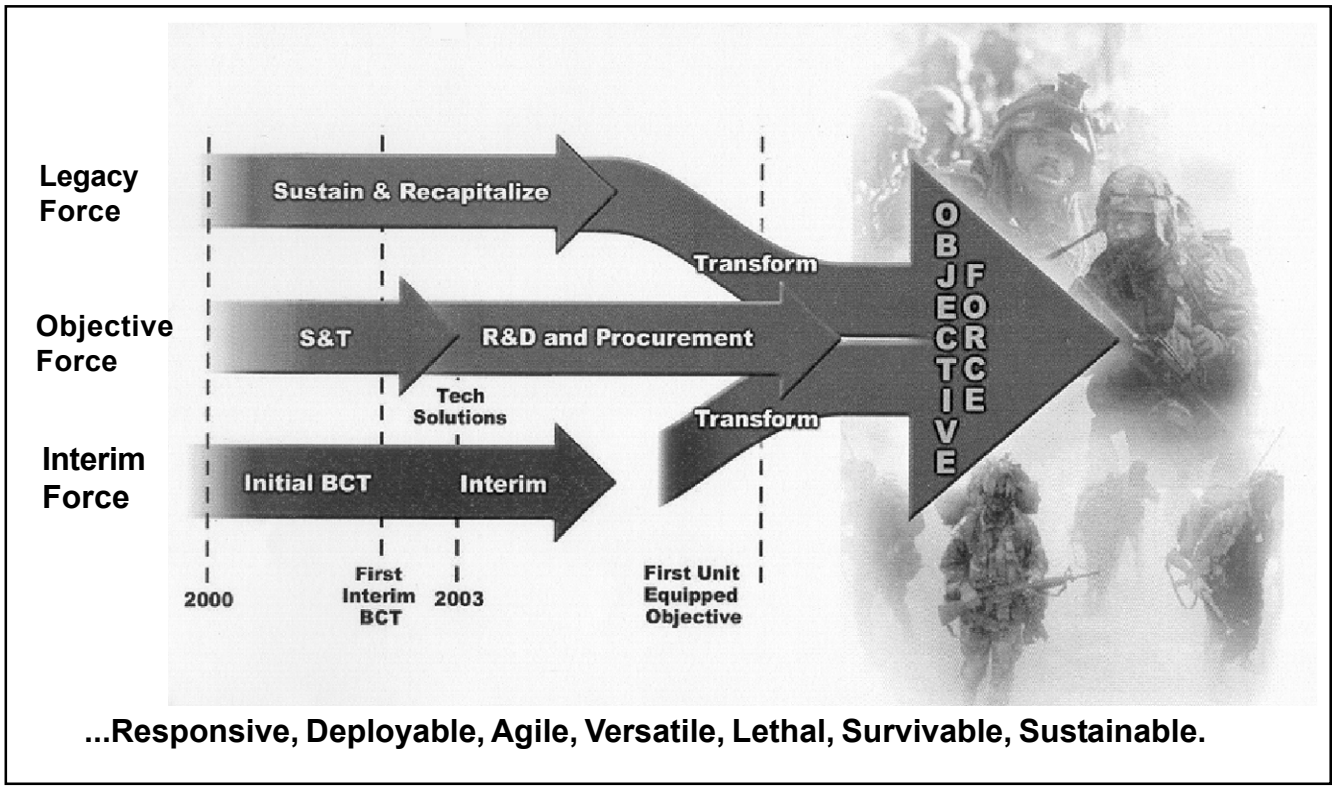

Figure 1. The Army Transformation

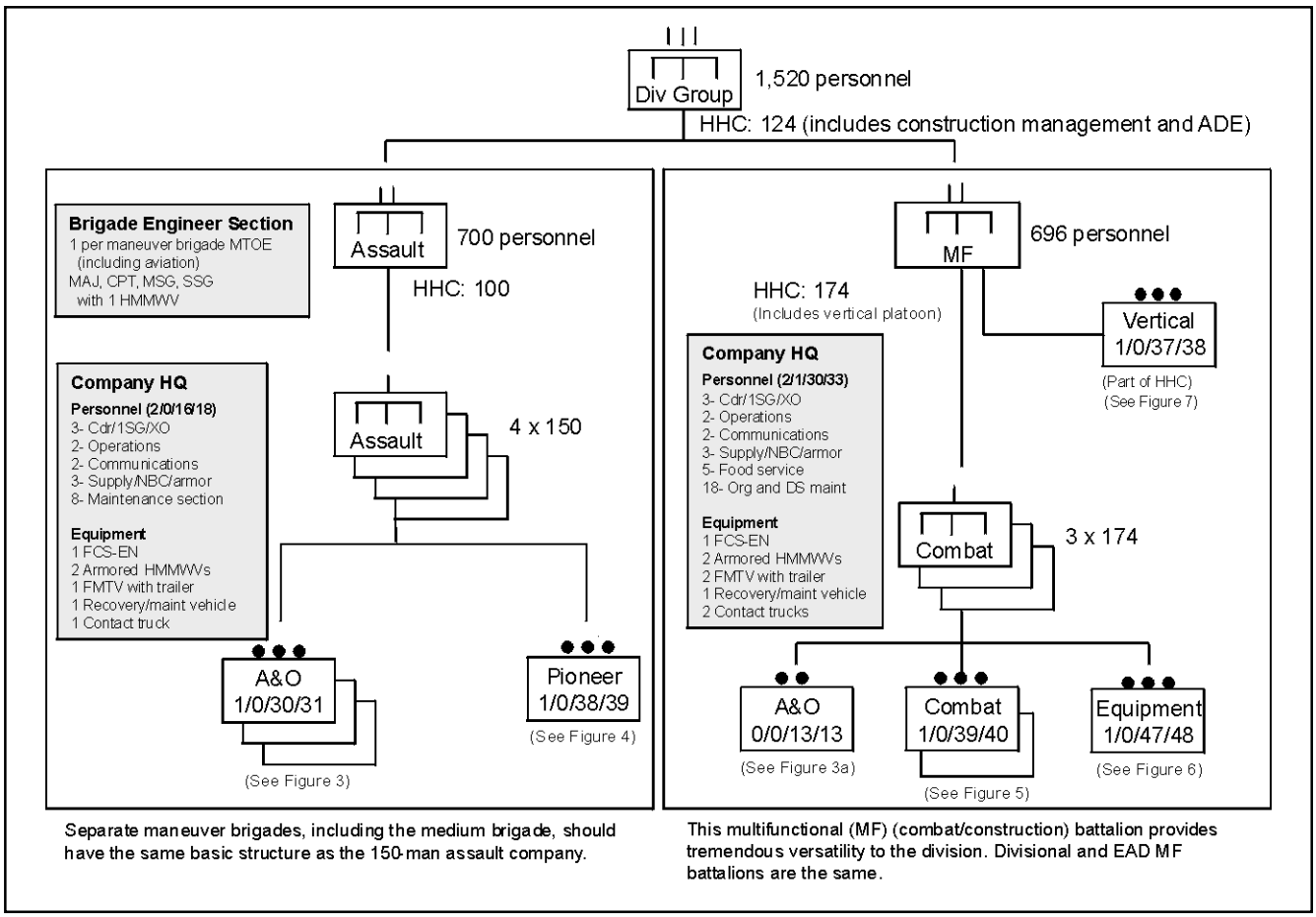

Figure 2. Standard Divisional Engineer Group Structure

obstacle (A&O) platoons (Figure 3) teamed with the pioneer platoon (Figure 4) provide the BCT with critical assault engineering support but are also versatile enough to support a broad range of missions. With this company, the BCT is more agile. It can go in early and support RSOI as well as stability, defensive, and offensive operations. Requiring less corps augmentation, it will be more deployable and sustainable than smaller, less versatile designs.

2. Field engineer groups with the interim divisions that have one assault battalion and one multifunctional (combat and construction) battalion (2003 to 2007). (See Figures 2 to 7, pages 9 and 11 to 13.)

- The assault battalion provides four small, yet capable, companies. Three of them can be normally associated with the three ground maneuver brigades. The fourth company can reinforce the main effort or support the aviation brigade.
- Figure 3a and Figures 5 and 6, page 12, respectively depict the A&O section, two combat-engineer platoons, and the equipment platoon found in the multifunctional battalion's line companies. Figure 7, page 13, depicts the vertical platoon found in the battalion HHC.

Figure 8, page 13, compares the current heavy divisional brigade with the proposed medium divisional group. The comparison shows that the proposed group has virtually the same assault capabilities as the divisional engineer brigade. (The loss of AVLBs is more than made up for by the ability to air assault Class 20 bridge sections that would be managed as a supply commodity.) However, the proposed group has far greater horizontal and vertical construction capabilities. The increase of 151 personnel is a result of making robust squads and platoons that are fully capable of operating and maintaining equipment 24 hours a day. In addition, the proposed group has most of the combat-engineer squads in the multifunctional battalion where their versatility can be fully utilized. This group is fully capable of supporting a broad range of missions without corps augmentation but can also command and control EAD assets without having to bring in a second O-6 group headquarters. The multifunctional battalion's HHC includes a construction-management section with design, survey, and materials-testing capabilities. As such, it can maintain and repair aerial ports and seaports of debarkation, MSRs, and lodgment areas with or without augmentation, depending on the amount of effort required.

The Army currently has two AC corps airborne battalions and three RC corps light battalions that are organized similarly to this design (including the A&O section—called a mobility/countermobility section). The design depicted here has larger squads and platoons; FCS-EN personnel carriers with dump trailers instead of 5-ton dumps as troop carriers; and a mixture of current equipment and new medium equipment such as a D6 dozer, a medium PLS, and an excavator (all less than 20 tons). The result is a fully air-deployable and air-assaultable force with excellent combat-engineering, force-protection, and firepower capabilities as well as horizontal construction capabilities similar to that of a combat-heavy battalion and a significant vertical capability from the vertical platoon and six combat platoons.

Note: Since interim divisional groups may not have a fielded IFV-EN dump trailer, a short-term solution would be to provide each combat-platoon headquarters an FMTV dump with a skid steer on a trailer. This vehicle could be hardened with ballistic glass and selected armor similar to a HMMWV's armor for improved survivability. It should also have a ring mount for MK19s or other automatic weapons (as should most of our trucks and HMMWVs).

If Army force developers balk at making the multifunctional battalion organic to the division, the multifunctional battalion could simply be assigned to the division for training purposes but remain an EAD asset. This is currently done with light equipment and CSE companies. It is key, however, that the division retain the C2 provided by the group headquarters in order to rapidly plan and conduct contingency operations.

3. Convert legacy light and heavy divisions to a similar two-battalion group (2003 to 2007). This would move the legacy organizations more in line with General Shinseki's vision of versatility and agility. The unit's current equipment and that found in current EAD battalions could be used for an interim organization. This would then be replaced by medium versions as the parent division was transformed into an objective division. This conversion would require equipment and personnel to be shifted from current EAD units such as corps airborne for light/airborne/air-assault divisions and combat-heavy for heavy divisions. Since so much of our active force currently resides in the heavy-division engineer brigades, standing up medium interim divisions with two-battalion groups will affect the entire force. Key decisions will have to be made on what units will be AC, RC, and multicomponent. That is why better integration of AC and RC structures is so important.

4. Convert corps combat-heavy, mechanized, and wheeled battalions to interim multifunctional battalions (same as the divisional group's multifunctional battalion) (2003 to 2007). Initially, an interim multifunctional battalion would be formed using current equipment (5-ton dumps as a squad vehicle and D7s). General-construction (vertical) platoons would be converted to combat platoons in the line companies. A vertical platoon would be added to the HHC in the combat-heavy battalions. Wheeled battalions would lose the third combat platoon per company but would gain horizontal and vertical capabilities. Mechanized battalions would retain most of their combat capabilities while gaining much greater horizontal and vertical capabilities. As current equipment is replaced, new equipment would be less than 20 tons (D6s replacing D7s). As mentioned above for the divisional combat battalion, these interim battalions would have to add a 5-ton dump with a skid steer on a trailer until a dump trailer with insert is developed. Before a medium CEV breacher is fielded to EAD units, an interim A&O section could be created using 5-ton dump trucks to haul MICLICs/Mongooses and Volcanos. Just as with the

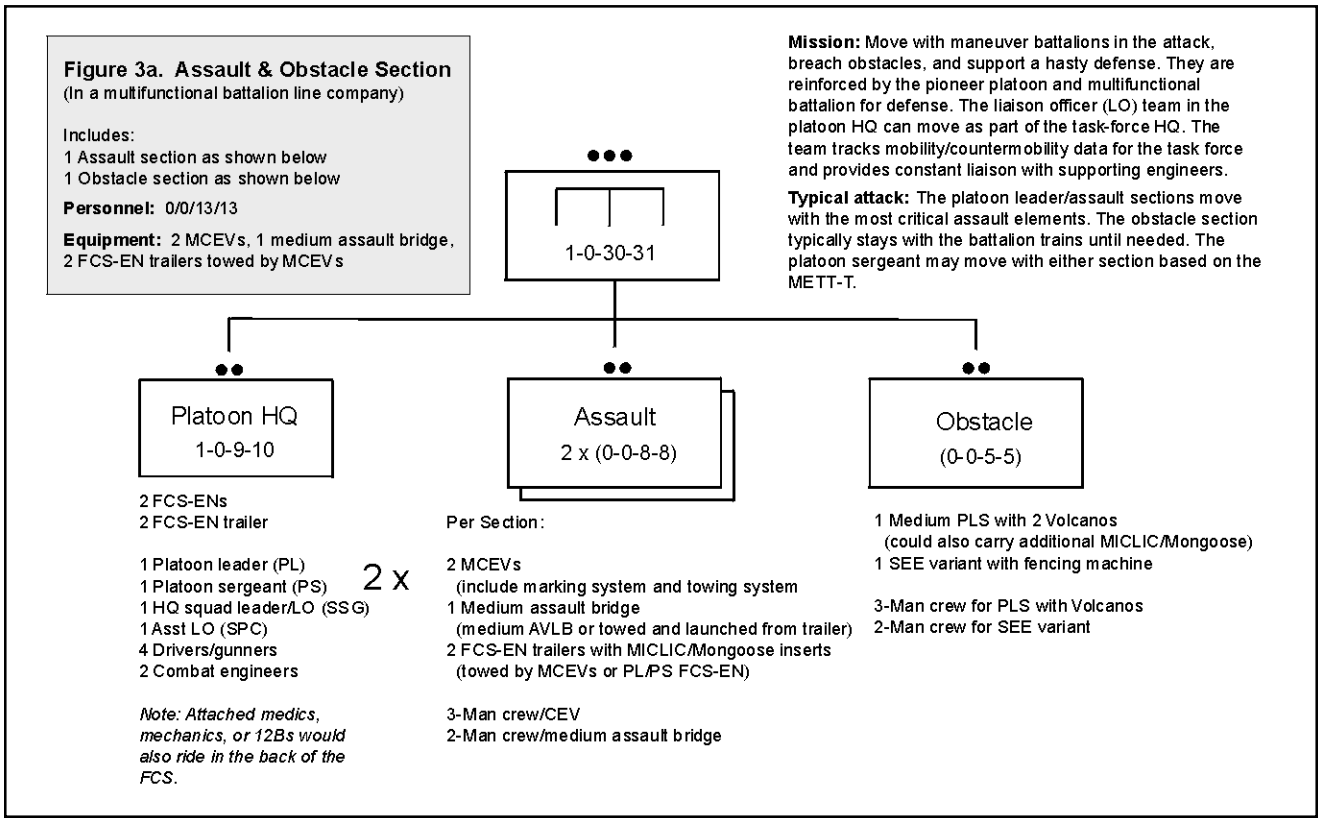

Figure 3. Assault and Obstacle Platoon (Divisional Assault Battalion)

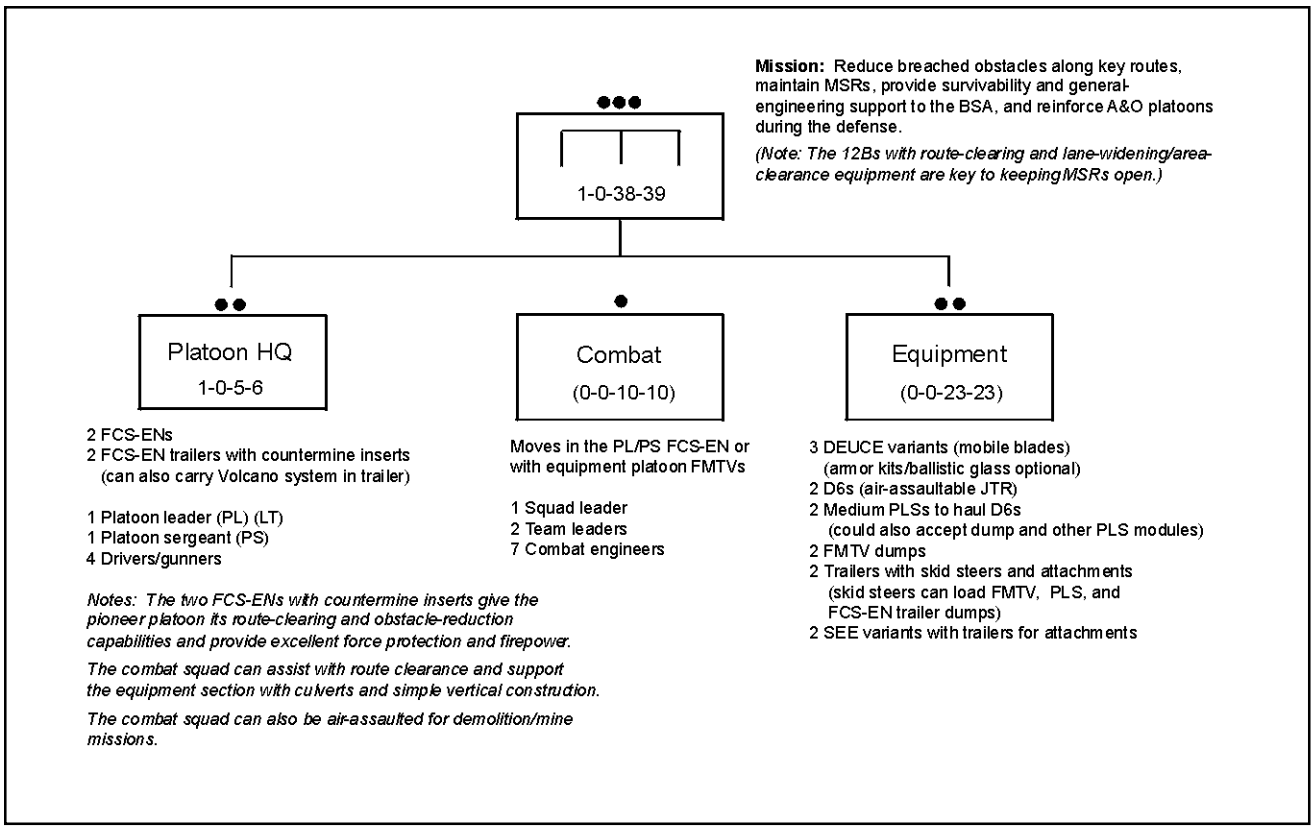

Figure 4. Pioneer Platoon (Divisional Assault Battalion)

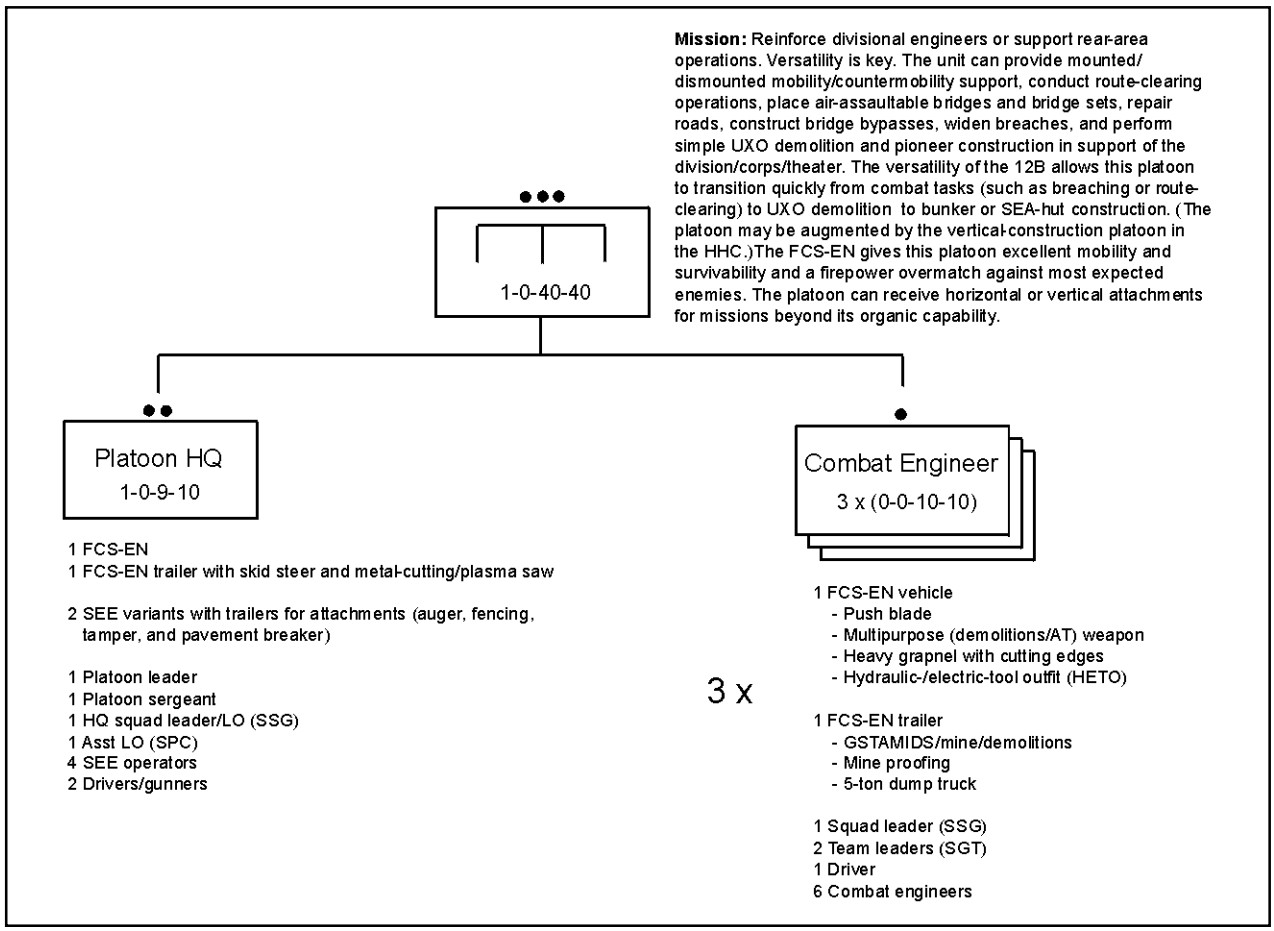

Figure 5. Combat-Engineer Platoon (Multifunctional Engineer Battalion)

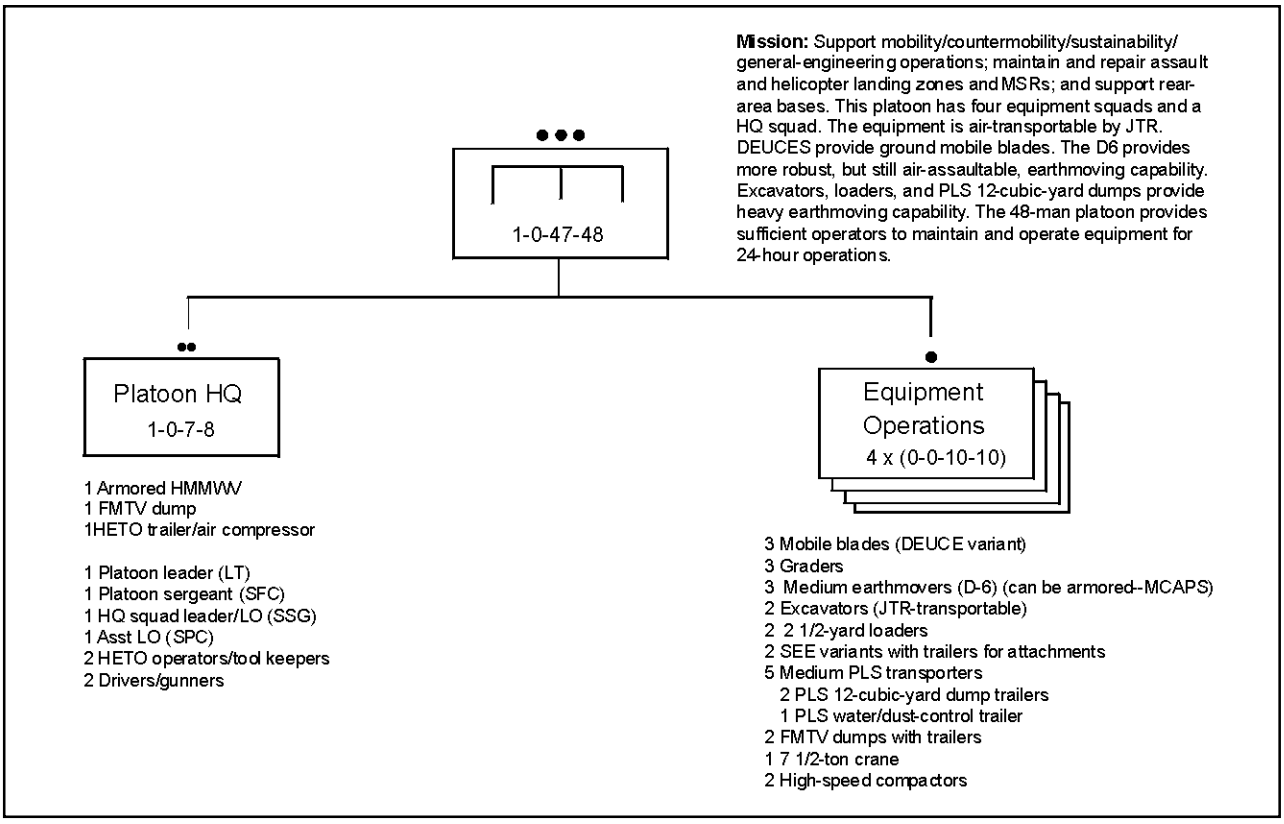

Figure 6. Equipment Platoon (Multifunctional Engineer Battalion)

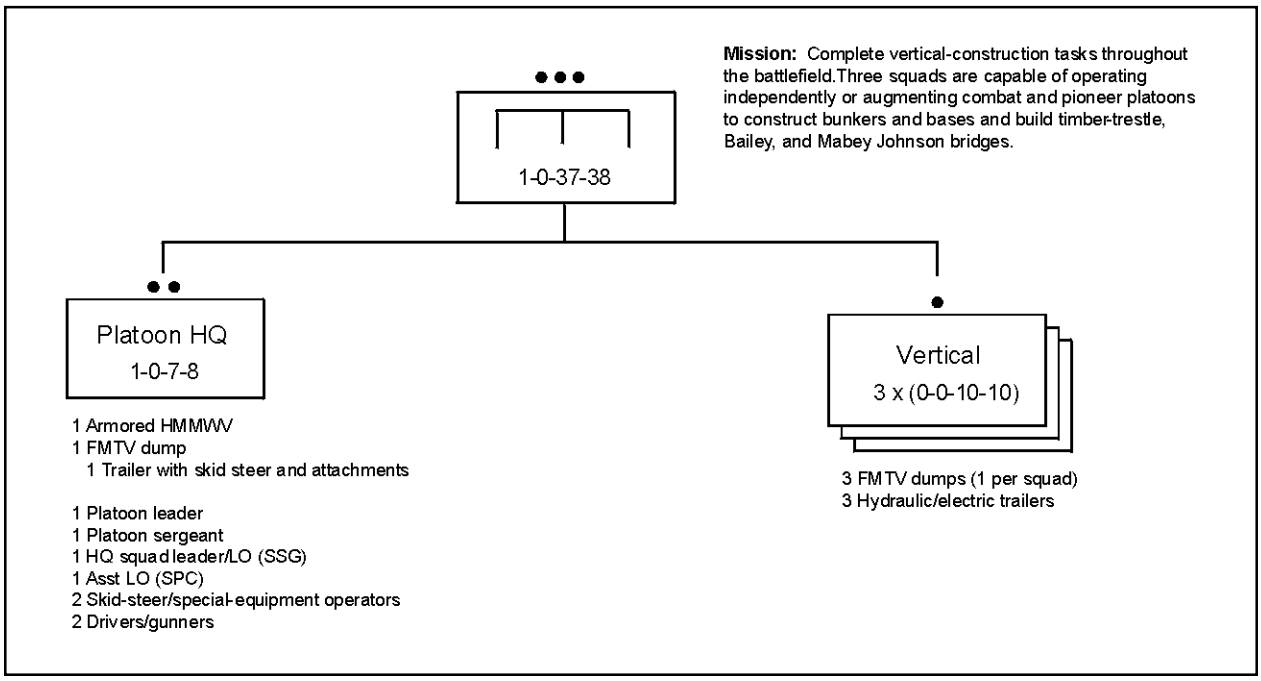

Figure 7. Vertical Platoon (Multifunctional Engineer Battalion)

Major Systems	Current Heavy Battalion	Current Heavy Div Engr Brigade	Proposed Assault Battalion	Proposed MF Battalion	Proposed Div Group (d+e+HHC)	Delta Current-Proposed (f-c)
(a)	(b)	(c)	(d)	(e)	(f)	(g)
ACE/DEUCE variants	21	63	0	9	9	-54
MCEVs	0	0	48	6	54	+54
APC/FCS-ENs	28	84	32	24	56	-28
FCS-EN dump trailers	0	0	32	24	56	+56
MICLICs/Mongooses	12	36	48	6	54	+18
Volcanos	6	18	24	6	30	+12
AVLBs/Med assault bridges	12	36	24	3	27	-9
Graders	0	0	0	9	9	+9
SEE variants	6	18	20	21	41	+23
D6 dozers	0	0	8	9	17	+17
High-speed excavators	0	0	0	6	6	+6
Med PLS equipment haulers	0	0	20	18	38	+38
PLS dump racks	0	0	0	6	6	+6
PLS water distributors	0	0	0	3	3	+3
FMTV dumps	0	0	8	13	21	+21
Cranes	0	0	0	3	3	+3
Skid steers	0	0	8	7	15	+15
Personnel	429	1,369	700	696	1,520	+151

Notes:

1. *All equipment for medium assault battalions and multifunctional battalions weighs less than 20 tons and is therefore air assaultable by JTR and transportable by C-17s and C-130s (newer versions). This not only allows the force to deploy by air but also gives it tremendous capabilty to move quickly to where it is needed by air assault.*
2. *The proposed divisional group has more personnel than the current heavy divisional brigade because it has more robust squads, platoons, and headquarters. It is much more capable of 24-hour operations and has equipment to support combat operations; maintain and repair aerial ports of debarkation and MSRs; and support RSOI, force buildup, logistics, and other bases.*

Bottom line: It is a versatile and agile organization.

Figure 8. A Companion of Major Engineer Systems of the Current Heavy Divisional Engineer Brigade and the Proposed Two-Battalion Group

interim combat platoon, these 5-ton dumps could be hardened with ballistic glass, armored cabs, and applique bottom and side armor. With a ring-mounted MK19, this would be a vast improvement in survivability and firepower over current 5-ton dump trucks.

5. Create vertical companies and merge current CSE, dump, and CSC into one type of separate horizontal company (2003 to 2007). Separate paving and quarry detachments would also be retained. The vertical separate companies would work primarily in nation/humanitarian assistance and rear-area bases. They would become building experts similar to prime-power platoons. These separate companies—along with already existing bridge companies—could work independently but more often would work under the control of a multifunctional battalion for design, testing, management support, and security. They should be assigned to a multifunctional battalion in peacetime for the same support.

6. Replace interim equipment with objective-force equipment as technology and funds allow (2007 to 2030). It is important to restructure sooner than later. This will help us avoid replacing/maintaining overaged equipment and units that we no longer need. We will undoubtedly lose battalion and higher headquarters in order to build units that are more robust at the execution level. While painful, this is the right thing to do—the fewer units we have to deploy, the less unit C2 "overhead" will have to be deployed with them. Early conversion will then allow us to focus on developing the equipment and fine tuning interim organizations in order to reach the objective force. A reasonable goal would be to field the first objective force engineer units in 2010. Interim units would then receive objective equipment as funds allow from 2010 to 2030.

Note: While putting a bridge company back in the division is tempting, we should avoid doing so since bridge companies are primarily single-purpose units and would not be needed for many contingencies. Also, bridging does not require extensive combined-arms training with the supported maneuver unit. We would be better off keeping bridge companies (active and reserve) as EAD assets. We should also ensure that sufficient bridge sets (such as the Class 20 described above, the Bailey, and the Mabey Johnson) are available for rapid forward delivery and emplacement by the divisional assault and combat battalions, or multifunctional EAD battalions.

Seize the Initiative

The engineer organizations and changes described in this article clearly support General Shinseki's vision:

Responsive and deployable. The medium division with its engineer group can deploy and conduct a wide range of missions with less EAD augmentation than current structures. The robust squads and platoons will be fully capable of 24-hour operations and therefore ensure that we get the most out of our deployed equipment.

Agile. Medium divisional engineers and EAD multifunctional battalions will be able to rapidly change from construction to combat operations and back again. The simplified, but more robust, C2 structure in the division and corps would allow deploying forces to keep the same engineer C2 team that they have trained with.

Versatile. Both divisional and corps engineers would be much more capable of supporting a full spectrum of operations. This versatility means that fewer types, and numbers, of engineers must be deployed. Integrating RC engineers into C2 headquarters at the division and corps levels allows us to take better advantage of the tremendous technical capabilities found in the RC. We can therefore provide better construction management, which is the key engineer mission in many low-intensity scenarios.

Lethal and Survivable. Multifunctional battalions (with IFV/FCSs) that replace combat-heavy and wheeled battalions will be much more capable of defending themselves and supporting combat operations, while still having excellent sustainment-engineering capabilities. The additional dig assets in the two-battalion group will also provide much greater survivability support to the division.

Sustainable. By making the divisional and corps engineers more versatile, and thereby reducing the number of corps engineers required, the deployed force is smaller and more easily sustained. The multifunctional battalions in the divisions and the EAD multifunctional battalions ensure that MSRs and aerial ports and seaports of debarkation remain open and keep logistics traffic flowing.

While our challenges may be great, so are our opportunities. If we seize the initiative by voluntarily reorganizing significant portions of the engineer corps to better support the Army's vision, we can control our own destiny and win future resource fights.

Lieutenant Colonel Lindsay is the Assistant Corps Engineer for the XVIII Airborne Corps. He has served with the 27th Engineer Battalion (Corps)(Airborne), the 13th Engineer Battalion/7th Infantry Division, the 36th Engineer Group (Construction) in Somalia, and the 20th Engineer Brigade (Combat)(Airborne Corps). LTC Lindsay also has served with the Nashville District, U.S. Army Corps of Engineers, as a facilities engineer in Hohenfels, Germany; and as an AC/RC advisor to a combat heavy battalion, an engineer group, and a theater Army brigade. He holds a master's in civil engineering from Vanderbilt University and is a registered professional engineer in Virginia.