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Alternative Approaches to Army Transformation

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Overview

Army transformation is an attempt to provide future forces with enhanced capabilities in lethality, survivability, and mobility, both strategic and tactical. Alternatives to achieving these goals differ in emphasis on weight and reliance on technology. That is, transformation plans differ if the objective is weight reduction as opposed to weight redistribution. In one approach, platform weight is reduced to meet mobility goals. However, shedding weight has implications for platform survivability and lethality; previous attempts to design a single platform that is simultaneously lethal, mobile, and survivable have not done so satisfactorily. Thus, advances in materials are required to insure the survivability of a lightweight platform. Advances in network technology are also required to make the platform more aware of its environment. The immaturity of these technologies increases the risks inherent in transformation based strictly on platform characteristics.

In contrast, weight redistribution considers parameters other than platform weight and networks to meet Army goals. Indeed, due to the weight of support assets, replacing all combat platforms with 20-ton vehicles reduces only marginally the overall weight of a division and corps. An alternative approach to transformation restructures Army forces into small, modular units, pre-positioned across the globe, and deployed in a time-sequential manner. This approach, with its reduced dependency on technology, is a practical near-term alternative and should be pursued in parallel with technology development.

While many lessons remain to be learned from Operation *Iraqi Freedom*, two already are firm and clear: air power is not a cure-all, and large, well-armed ground forces are still needed for expeditionary warfare. However, heavy Army forces that were so important to success in this war still lack the capacity to deploy overseas swiftly enough.

Until the problem of slow Army deployment rates is solved, the world's best military runs the risk of performing poorly or failing to achieve national political objectives in future crises. Recognizing that the U.S. military cannot wait a decade or longer to produce new technologies that still may not solve the rapid deployment problem, the *Army Transformation Roadmap 2003* states that the goal of transformation is to "identify and build required capabilities now . . . while developing future force capabilities essential to provide relevant, ready, responsive, and dominant land power to the Future Joint Force."[1] Indeed, one aspect of Army transformation efforts is force redesign to develop an active component capable of deploying a responsive, agile expeditionary force in the first fifteen days of an operation.[2]

Much of the tonnage now devoted to Army assets must be shipped by sea, because the capacity of U.S. strategic airlift is insufficient. Consider that each cargo ship must be individually loaded at ports in the continental United States, sailed thousands of miles, and offloaded at foreign ports. Loading and offloading a single cargo ship alone can take two or three days. Shortage of cargo ships, poor offloading facilities at foreign ports, and other problems can create bottlenecks that considerably delay shipments. This reliance on slow-moving cargo ships to transport weighty forces lies at the heart of the Army deployment problem.

How the Army achieves its transformational goal of rapid deployment depends on its perspective on weight. That is, transformation plans differ if the objective is weight *reduction* as opposed to weight *redistribution*. Weight reduction is primarily platform-centric and relies on technological advances in materials and network technology to deliver a single lightweight platform capable of surviving heavy combat. Weight redistribution considers parameters other than platform weight and the ability to distribute information in networks to meet Army goals; forces are re-structured into small, modular units, pre-positioned across the globe, and deployed in a time-sequential manner. Although the second approach is less dependent on technology, it is possible only if Army forces are considered malleable in time, space, and structure.

A Platform-Centric Approach

As a result of transformation, Army forces will be capable of both strategic and tactical mobility. The Army will no longer need to mass before attacking but will mass and attack simultaneously. For the attack to be successful, mobile Army forces must be both survivable and capable of bringing to bear sufficient firepower. The trade-off between mobility, survivability, and lethality presents the greatest challenge to transformation based on reducing the weight of a single platform.

The Army already is addressing this by developing 20-ton platforms that can be deployed rapidly. The Army is currently delivering six Stryker brigade combat teams (BCTs) to fill an operations gap between heavy and light forces. Two Stryker BCTs have been delivered, one to the 3rd Brigade, 2nd Infantry Division (presently serving in Iraq), and the other to the 1st Brigade, 25th Infantry Division (light infantry). The Army also is developing a set of manned and unmanned ground vehicles and unmanned aerial vehicles collectively referred to as the Future Combat Systems (FCS). To facilitate rapid deployment, the Stryker family of vehicles and all FCS platforms are required to fit inside a C–130. Whereas Stryker is designed to fill a current need, FCS is intended to replace all platforms currently employed by the Army over the next thirty years.

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In plain terms, the FCS program is intended to give the Army future force the mobility of existing airborne units and the firepower of existing heavy divisions. This dilemma—developing a force with the mobility of light infantry and the firepower of armor—has been with the Army since World War II, when Army ordnance engineers first tried to build a light tank that could be carried by a glider and landed with parachutists and glider-borne infantry. Since that time, the Army has struggled to produce a mobile vehicle under 20 tons in weight that is capable of delivering impressive firepower while protecting its crew. Light tanks and infantry fighting vehicles provide examples of how this trade-off has been achieved over the years (see tables 1 and 2).

The light tanks, tank destroyers, and gun platforms listed in table 1 were designed primarily to protect light infantry against tanks and infantry supported by tanks. Thus, emphasis was placed on lethality and survivability, not mobility. The data indicate that light tanks became heavier as they confronted more powerful threats. The reasons for this increase are two-fold: heavier munitions were required to combat the more powerful threats, and more armor was necessary to protect crews. Light tank development came to an end in the 1950s, by which time the M41A1 light tank was almost as large as a medium tank of World War II. Eventually, the Army abandoned the light tank concept altogether.

Alternative versions of the light tank designed to provide firepower to airborne forces emphasized mobility and lethality, not survivability. In World War II, the Army developed the M22, which could be carried by a glider. But the lightly armored M22 did not provide adequate protection against enemy tanks. When the Army tried again in the 1950s to provide firepower to airborne forces, it sacrificed protection completely in favor of firepower and mobility. The result was the M56 gun platform, which was a 90–mm gun mounted on a tracked chassis with no armor for the crew. In an extreme example, the M50 sacrificed both crew protection and mobility in favor of firepower; it carried six 106–mm recoilless rifles and had little armor. The assumption of its developers was that the M50, because of its small size, might be able to ambush larger enemy vehicles and overwhelm them with a massive salvo from a simultaneous discharge of several or all of its six recoilless rifles. (Similar thinking has been applied to the design of the FCS.)

In contrast to light tanks, armored infantry fighting vehicles (IFV) were designed to minimize weight and cost, and maximize protection for the infantry carried inside. The first vehicle, the 1942 half-track, was produced in great numbers during World War II only because the need to field some form of protection for mechanized infantry was great and the Army had little else to offer. The half-track's armor was thin and could be penetrated by .50 caliber bullets, and its front-mounted engine was vulnerable.

The Army's first real IFV was the M44 of 1946. The M44 provided adequate protection for the infantry it carried, but at 51,000 lbs., its combat weight limited mobility and dramatically increased cost. The M75 and M59 of 1953 weighed less than the M44 and actually provided increased protection for infantry but were too heavy to be airlifted and could not float.

The M113 finally met the needs the Army had identified in World War II. It was light, easy to produce in large numbers, mobile (air transportable and capable of swimming small rivers), and capable of protecting the infantry it carried from machine gun fire and shell fragments. As a result, the M113 spawned a family of vehicles for such tasks as command and control, engineering, indirect fire support (from a mortar carried inside the vehicle), and even chemical smoke generation. The M113 was such a success that variations of the basic model are still in active service, and the newer M113A3 was even put forward as an alternative to the Stryker wheeled vehicle.

What happens when designers shift the balance among firepower, mobility, and protection is indicated in table 2. The M2 Bradley IFV, for example, has significantly more firepower than the M113 and somewhat better protection for the soldiers it carries, but it sacrifices mobility; it is significantly heavier than the M113, and heavier even than the M113A3, so it cannot be air dropped. (The M2 and its brother, the M3, provided significant levels of organic fire support to mechanized infantry engaged in combat in Iraq.)

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Table 1. Light Tanks

Model	Year Fielded	Armament	Weight (lbs.) Combat	Weight (lbs.) Transport
M3 "Stuart"	1941	37 mm	28,000	25,600
M5 "Stuart"	1943	37 mm	33,100	30,800
M22 "Locust" for glider troops	1943	37 mm	16,400	14,600
M24 "Chaffee"	1945	75 mm	40,500	36,300
M18 "Hellcat"tank destroyer	1944	76 mm	39,000	35,500
M41A1 "Walker Bulldog"	1953	76 mm	51,800	44,700
M56 self-propelled anti-tank	1954	90 mm	15,750	12,500 for C–119
M50 "Ontos" gun platform	1955	six 106–mm recoilless rifles	19,050	16,450
M551 "Sheridan"	1965	152–mm gun-missile launcher	33,460	28,525 for C–130
M8 "Buford"	1994	105–mm gun	38,800	36,900 for C–130

Source: R. P. Hunnicutt, *Stuart: A History of the American Light Tank*, vol. 1, (Novato, CA: Presidio Press, 1992), and *Sheridan: A History of the American Light Tank*, vol. 2, (Novato, CA: Presidio Press, 1995).

Table 2. Armored Fighting Vehicles

Model	Year Fielded	Armament*	Armor (inches)**	Weight (lbs.) Combat	Weight (lbs.) Transport
M3 halftrack	1942	.50 cal.	0.25	20,000	unknown
M44	1946	.50 cal.	0.50	51,000	41,000
M75	1953	.50 cal.	0.625	41,500	36,669
M59	1953	.50 cal.	0.625	42,600	39,500
M113	1960	.50 cal.	1.50	22,900	20,160 for C–130
M113A3	1990	.50 cal.	1.50	31,000 with appliqué	22,128 for air-drop from C–130
M2 infantry fighting vehicle	1981	25 mm	1.50	50,259	42,289
M3 cavalry fighting vehicle	1981	25 mm	1.50	49,945	41,975

* Primary armament only. Armament includes more machine guns than .50–caliber machine gun for the vehicles up through the M113A3, and a machine gun in addition to the 25–mm chain gun for the M2 and M3.

** Armor is not distributed evenly around these vehicles. The figures given are for armor on the upper sides of the vehicles. Frontal armor in each case was or is heavier.

Source: R.P. Hunnicutt, *Half-Track: A History of American Semi-Tracked Vehicles* (Novato, CA: Presidio Press, 2001), and *Bradley, A History of American Fighting and Support Vehicles* (Novato, CA: Residio Press, 1999)

This historical discussion sustains the general point that physical constraints require tradeoffs in platform development. If the objective is firepower, for example, one has to pay for it with reduced mobility or protection. The World War II half-track, for example, served as the platform for a variety of weapons, from quad-mounted .50-caliber machine guns to 57–mm and 75–mm anti-tank guns. That increase in firepower came at the expense of survivability. In the M113, the Army chose to emphasize mobility over firepower.

In recent years, the proliferation of infantry-carried, rocket-propelled grenades (RPGs) with shaped-charge warheads has increased concern for protection. This is especially true for Strykers, which have been deployed in Iraq. Their armor cannot withstand a hit by an RPG. To counter the RPG threat to Strykers, so-called slat armor has been added to the exterior. The spacing between the slats is such that the cone of an RPG is pinched, which detonates the RPG away from integral armor. Slat armor first proved its value in January and again, more famously, in February during a visit to Iraq by Deputy Secretary of Defense Paul Wolfowitz. Disadvantages of the armor are that it adds weight and bulk to the vehicle and must be installed after deployment.

Although advances in technology have led to the development of ceramic- and composite-based lightweight armors capable of surviving a hit from a medium-caliber weapon (smaller than 30 mm), this falls short of the M1A1 Abrams' ability to withstand a 125–mm round. Thus, increasing protection means reducing one of the factors already discussed, *unless some technological breakthrough introduces a new factor and eliminates the need for the conventional trade-offs in weight.*

Even if a material were developed that provided the same protection as the armor on the Abrams without adding to platform weight, the lighter platform would still be more vulnerable. A 20-ton platform, for example, is 3.5 times less massive than an M1A1. If both are hit with the same force, the lighter platform will be accelerated 3.5 times faster than the M1A1, which might kill or seriously injure the crew.

Thus, a 20-ton platform, whether equipped with current or vastly improved armor, must be more aware of its surroundings than a tank and more sensitive to threats. The FCS program attempts to make its platforms more aware through active protection technologies and countermine sensing. Active protection systems are designed to sense a round and deflect or destroy it prior to penetration (using, for example, ejecting armor plates to alter trajectory) or defeat it in some manner after penetration. The Army expects that initial FCS platforms will be capable of defeating shaped charge weapons, including RPGs, but the deflection of larger munitions or kinetic-energy rounds is not expected for another decade. The development of stealth technology for ground vehicles as a means to avoid detection also is not expected to mature for another decade.

Due to the simple trade-off between weight and speed, none of the previous attempts to provide lethality, mobility, and survivability within the physical limits of a single platform have done so satisfactorily. But making platforms more aware is not enough to achieve Army goals. Awareness must encompass the battlefield. Hence, the Army is shifting emphasis from developing only platforms to developing a system of systems. To truly meet Army goals for transformation, old constructs must change or be replaced, and new degrees of freedom must be introduced. The present Army solution relies on the deployment of network technologies.

A Network-Centric Approach

If conventional trade-offs are inadequate to meet Army transformation goals, new ones need to be considered. The trade-off the Army seeks, at least euphemistically, is information for armor. However, information always has been critical to military operations. Whether for obtaining situational awareness or conveying a commander's intent, militaries have consistently employed the most advanced communications technologies of their day. The focus of transformation is not so much information exploitation as it is deploying and exploiting network-based technologies: a platform-centric approach to transformation that relies on deploying 20-ton platforms is inherently dependent on the network to insure the platform's survivability.

The emphasis on deploying network technology on the battlefield is similar in spirit to previous efforts to bring computing technology to the battlefield. Consider, for example, the mission of fire control. The first automated fire control system, the Field Artillery Digital Automated Computer (FADAC), was fielded in 1959.[4] The transistor-based FADAC was essentially a special purpose calculator that occupied 5 cubic feet, weighed 175 pounds., and consumed 700 watts. Using manually entered data, the FADAC calculated and displayed gun orders (i.e., gun deflection, quadrant elevation, fuze time, and charge) on 16 numerical indicator vacuum tubes. Fire control capabilities were expanded and automated with the development of the Tactical Fire Direction System (TACFIRE), first fielded in 1978.[5] In 1992, the Light Tactical Fire Direction System (LTACFIRE) for light forces and the initial fire support automated system (IFSAS) for mechanized forces were fielded to provide capabilities similar to TACFIRE, but with considerably smaller equipment. In 1997, the Advanced Field Artillery Tactical Data System (AFATDS), which relies on digital communication to conduct command and control, replaced these systems.[6]

Efforts to automate the artillery fire control mission were mirrored in other branches and services, which contributed to the now-familiar “stovepipes.” Stovepipes, therefore, were a consequence of the available technology, not lack of imagination. Given that the Internet was in its infancy in the 1970s, it was difficult to plan for a networked force.

While fire control became more automated and linked in the early 1990s, the commercial world was becoming interconnected. By the time AFATDS was delivered, some of its shortcomings were obvious. The maturing in the 1990s of networking technology and the tools for its use made military employment of networks a reality, and it is now possible to pursue the integration of stovepiped mission applications. For example, when sensors are networked to fire control and fire control to logistics, the rate of munition resupply can match the rate of threat removal.

The most visible application of networking to the battlefield is the Force XXI Battle Command, Brigade-and-Below (FBCB2) system, which was first deployed with units in Operation *Iraqi Freedom.* Through its capabilities in position-navigation and reporting and combat identification, and its interface to terrestrial communications, FBCB2, also called "blue force tracker," provides situational awareness, and command and control to the lowest tactical echelons. For operations over long distances or rugged terrain, there is also an interface to satellite communications. FBCB2 also provides a shared common picture of the battlespace using graphics displays.

FBCB2 is a system of approximately 1,000 computers networked in a single maneuver brigade. The network is based on a fixed set of addresses and, prior to deployment, the network must be planned, and addresses assigned and loaded. At a hardware level, planning entails assigning frequencies and circuits. Once operations have commenced, network resources must be monitored and managed constantly to reconfigure the network and deactivate circuits. The system is presently incapable of starting, operating, and gracefully degrading under all conditions without human intervention. Network reconfiguration and deactivation are not autonomous.

Given that the network is critical to survivability, the amount of latency (delay) is a critical parameter; reconfiguring the network manually robs operations of precious time. Mobile ground forces demand an ad hoc network capable of reconfiguring itself constantly as nodes come onto or fall off the network. Unfortunately, the mobile ad hoc network (MANET) protocols necessary to sustain the network reliably remain under development, and the Internet Engineering Task Force (the protocol engineering and development arm of the Internet) has not yet established standards.

The utility of mobile, ad hoc networking has already been demonstrated in two DARPA projects, the Small Unit Operations Situational Awareness System (SUO SAS) and FCS Communications.

SUO SAS is a MANET-based, networked radio designed for a unit cell of 20 dismounted soldiers. It was successfully demonstrated in a simulated helicopter rescue at Fort Benning in October 2002 and has since been transitioned to the U.S. Army Communications-Electronics Command for further development. FCS Communications demonstrated a MANET-based networked radio system for a unit cell of 20 ground vehicles and 2 aerial vehicles in a mock operation at the Army National Guard Orchard Training Area in Boise, Idaho, in August 2003. FCS data rates were10 megabytes per second with latency on the order of 100 milliseconds. This performance is needed to support real-time fire control and robotic missions, yet provide low probability of detection and robustness to jamming. FCS Communications uses both directional antennas at low frequency bands, which match frequencies allocated for the Joint Tactical Radio System (JTRS), and directional antennas at millimeter-wave frequencies.[7]

DARPA efforts demonstrate the maturity of the communications technology that forms the infrastructure of the FCS network but by itself does not provide any operational capability. Operational capability is provided by the applications executed over the network. This capability is under development but has yet to be demonstrated. Mobile command and control is the focus of the Agile Commander Advanced Technology Demonstration (ATD) under the direction of the Army Communications-Electronics Command and DARPA FCS Command and Control program.

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Further, the Department of Defense, through programs such as the Global Information Grid[8] and Transformational Communications[9] are establishing the backbone to support the flow of data required for networked communications and the data standards and databases that will allow for data access across platforms. These programs rely on a fixed infrastructure of landlines, wireless, and satellite communications for bandwidth and communications capability to allow corps and division headquarters to reach back for information.

However, the immaturity of application development and execution for mobile networks raises the risk in deploying network technology to the battlefield. Once deployed, the applications must remain stable while the network is constantly reconfigured, because failure of an application leaves ground forces vulnerable and dependent on platform technologies for survivability. This is reflected in the design philosophy for FCS survivability: don't be seen, don't be targeted, don't be hit, don't be penetrated, and don't be killed. The assumption is that network technologies, in combination with stealth, will confound the acquisition and targeting of U.S. ground vehicles. When these fail, active and passive vehicle protection technologies, as well as personal protection, are required.

Army insistence that all platforms satisfy the C–130 requirement is indicative of platform-centric thinking; critics of the FCS who point to the vulnerability of 20-ton platforms are guilty of the same offense. A networked approach to warfare requires an integrated approach to survivability. If transformation implies moving philosophically from a platform-centric military to one that is network-centric, survivability encompasses the likelihood not just that a platform (and its crew) will survive a hit but that it will be targeted and fired on in the first place. From a strategic perspective, survivability becomes an integrated measure across the battlefield and the mission. Advocates of network centric warfare believe that exploitation of information increases overall survivability.

In this regard, the Army approach to survivability is correct. Removing potential threats before they have become deadly threats and replacing large-signature ground vehicles with distributed, low signature vehicles, some manned and some unmanned, degrades an enemy's ability to destroy friendly forces. However, as currently conceived, this solution relies on technologies that remain immature and untested. Framing Army transformation in terms of a system of systems is correct, but relying heavily on network technologies to enhance the survivability of 20-ton platforms is risky.

Although the capabilities that network technology can bring to the battlefield are obvious, there exists little quantitative data based on field experience to substantiate their impact. It is not yet possible to determine how many fewer ground platforms are required as the number of nodes on the network increases, or how much lighter ground platforms can be made. Increasing the speed of transmission and the number of unfettered transmission links certainly allows the Army to improve execution of its present missions. But no data exists that allows one to calculate the advantages of networking as a force multiplier. We are not suggesting that work towards this goal be stopped or slowed. However, considerable work remains to be done.

These inherent risks prompt us to consider an alternative, near-term approach to transformation. This approach does not rely on technology but on the disposition and organization of Army forces to redistribute rather than reduce weight.

Transformation Based on Force Structure

The lynchpin of Army transformation efforts is the requirement that all platforms be C–130 transportable. This constraint reflects the interpretation of the link between weight and deployment addressed above. It drives weight down, which leads to the need for active protection and network technologies to insure the survivability of lightweight platforms. But perhaps the goal should be to reduce overall weight of the force, including support structures, rather than the weights of platforms.

Even though the Army has already trimmed some assets from its old Cold War model, the current heavy corps of three divisions and 103,000 troops still weighs one million tons (see table 3). Why do Army forces weigh so much? Some point to the Abrams tank, Bradley IFV, and Palladin artillery tubes as the principal reason armored or mechanized divisions weigh fully 110,000 tons, far more than the 68,000 tons of a standard infantry division. Yet these three platforms account for less than 20 percent (about 20,000 tons) of a heavy division's weight while providing half its combat power and virtually all

Table 3. Estimated Weight of Army Heavy Corps

Unit	Weight (tons)
Armored cavalry regiment	2,300
3 heavy divisions	330,000
Separate heavy brigade	27,000
Corps combat support	100,000
Corps combat service support	100,000
Echelons above corps	55,000
War reserve munitions and stocks	365,000
Total	**1,000,000**

Source: MTMCTEA Pamphlet 700-5 "Deployment Planning Guide: Transportation Assets Required for Deployment, (Newport News, VA, May 2001, Military Traffic Management Command).

its offensive punch. The 101st Air Assault Division, which relies on light infantry and attack helicopters and, therefore, has few tanks and IFVs, nonetheless weighs 100,000 tons because of its many helicopters and associated support assets.

Although a heavy division and its support assets require 50 or more cargo ships of sealift, even a 17,000-ton light division can require nearly 40 ships. Since sailing accounts for nearly two-thirds of the time needed to deploy forces to the Persian Gulf, and loading and off-loading only one-third, a light division may arrive in the Persian Gulf only a few days sooner than a heavy one. Often the marginal change in deployment is insufficient to justify the reduced combat power.

We note that replacing the existing tanks, IFVs, and artillery tubes with 20-ton FCS vehicles reduces the weight of a heavy division from 110,000 tons to 95,000, approximately a 15 percent reduction. Further, due to support units, the weight of a three-division heavy corps (armored or mechanized) drops by only 7 percent from one million tons to 930,000.

If light vehicles are fielded in large numbers, a medium infantry brigade will require about 500 C–130 sorties for its maneuver units, plus an additional 200-300 sorties for its logistic support and sustainment stocks. Whether the Air Force is capable of making available such a large number of sorties while attending to all its other lift requirements is problematic at best. The bottom line is that, even though it is reasonable for the Army to contemplate airlifting a single brigade with light vehicles swiftly into a hot combat zone, larger formations will have to be transported by sealift, which, unless other changes are made, will still take two to three months.

A simple way to speed the deployment of Army forces is increased prepositioning of Army equipment overseas. The most likely places for future combat are, for the most part, known. Today the Army has eight brigade sets positioned in Europe, Southwest Asia, and Asia. It already possesses ample numbers of tanks, IFVs, artillery tubes, and other weapons assigned to war reserves and National Guard units that could be used to form additional prepositioned brigade sets. Creation of another six to eight equipment sets would be costly, but it would significantly accelerate the rate at which Army combat forces can deploy. Ideally, such equipment sets should be deployed afloat on ships that can sail quickly to crisis zones.

Redistributing weight through prepositioning is worthy of discussion but does not address a more fundamental issue. If the existing armored corps, at a weight of one million tons, is too big and ponderous, what type of formation or formations should replace it in order to deploy rapidly and still fight effectively?

Consider that transformational thinking at the tactical level aggregated individual platforms into an integrated system of systems to create mass. Advantages derive from a system of systems that is comparable in capability to the aggregation of mass but is more dispersed and requires fewer resources. Applying similar thinking at the operational level leads to capability-based combat groups that are smaller than today's standard divisions and constructed as modules with interfaces to joint structures and with "hooks" to allow the integration of combat groups into corps-like structures for different missions.

Douglas Macgregor proposed restructuring a corps into four combat groups for armed reconnaissance, combat maneuver, strike, and early-deployed support.[10] Fundamental to the operational architecture is the reduction in logistics and the recognition that fire support and C4ISR are joint operations, not Army operations. Some of the groups, especially the light reconnaissance strike group, are dependent on network technology. Truly transformational benefits could be derived if the Army were to deploy this technology into organizations designed with the technology in mind.

Douglas Macgregor proposed restructuring a corps into four combat groups for armed reconnaissance, combat maneuver, strike, and early-deployed support

However, in the mid-term, reduced logistics can be achieved via an armored corps of 65,000 troops in six or seven maneuver brigades. For medium-sized contingencies, this new force should allow a single, strong Army corps to converge and begin fighting more rapidly than now. It allows the Army, in effect, to take a running start, rather than waiting for large, sustaining assets to deploy over a period of days and weeks.

Similar to Macgregor's proposals, the reduced corps should be modular by design. That is, it should be able to able to deploy and fight as a cohesive unit at its normal size of 65,000 troops, but have the capacity to inflate to 103,000 troops when situations mandate greater strength. For large contingencies, two of these reduced corps could deploy in the same time that a single corps can deploy today. The result would be more combat power for initial battles. If necessary, extra sustainment assets could be deployed *after* the arrival of key combat and support assets. Had this force been available for Operation *Iraqi Freedom*, the Army might have been able to deploy several more combat brigades than the seven actually deployed on the first day of the engagement. The cost would have been less logistic support and long-term sustainment, but the benefit might have been the quick victory sought by U.S. strategy. (The Army already has a capacity to deploy a small corps by stripping down its parent version, but hasty improvisation compels Army forces to fight in ways other than those for which they were trained and prepared.)

The current big corps reduces the incentive to think jointly in terms of integrated air-ground fires and creates a rationale for postponing aggressive combat operations until the full set of big-corps assets is on the ground. We propose the creation of a small corps as the norm and generation of a large corps as an exception to the rule. The Army thus would anchor its doctrine, training, and practices for expeditionary warfare on a small corps, while still having the flexibility to employ large formations. In other words, the Army would learn to think small in more ways than one, while retaining the capacity to think and act big.

Can such a smaller corps be created? While the answer is uncertain, the search for a solution should be based on the premise that, in expeditionary wars, U.S. forces normally will fight enemies that are less well armed and less capable than the Soviet army of the Cold War. Moreover, the increased lethality of U.S. weapons allows ground combat forces to destroy more enemy targets and occupy more territory than before. As a result, the future force may need fewer fire and maneuver assets. Above all, it will need fewer sustainment assets for prolonged conflicts, because most expeditionary wars are likely to involve less-intense combat, consume fewer resources, and be shorter than the big wars of the past. These propositions provide a basis for thinking about structural changes that might become possible as the information age accelerates and new technologies enter the inventory.

During the Cold War, operational plans typically committed only about one-half of a corps' maneuver battalions to the forward battle in the initial stages. The remaining battalions were held in operational reserve and mainly were intended to function as unit replacements for forward-committed units that were expected to suffer heavy attrition. This practice remained the case even as the Army shifted from linear defense to non-linear operations. During the famous "left hook" of Operation *Desert Storm*, a surprising number of maneuver battalions assigned to VIIth Corps and XVIIIth Corps were withheld as tactical reserves and never saw combat.

Further, because initial attrition for future expeditionary wars will be lower than the Cold War model, and because many forward-committed battalions will be able to perform their missions without big reinforcements from rear areas, the future corps may require only six to seven maneuver brigades. Beyond this, the introduction of remote, standoff-fires promises to further increase the lethality of Army forces and lessen the requirement for close-combat capabilities. If the elimination of three combat brigades proves feasible, the weight of a heavy corps can be reduced directly by 100,000 tons and indirectly by another 100,000 tons by reducing support needs.

To enhance further U.S. capabilities for swift force deployment, the creation of additional brigade sets should be combined with programs to strengthen airlift and sealift forces, and develop better military infrastructure in distant areas where operations might become necessary. Likewise, improvements to the planning process for strategic lift and power projection can also help, including the improvement of processes within the Transportation Command.

The main goal here is to design a swift and agile Army corps that can deploy quickly and fight effectively in the initial stages of an expeditionary war. With such a new and leaner structure, the key combat and support forces for one or two corps could arrive and begin operations without waiting for additional, large, sustainment-oriented assets to arrive. But because this smaller corps is modular, it could absorb such assets, when they are deployed. Thus, combat and support assets taken away from the parent corps would remain in the Army force posture, and could be deployed when needed. They would help form a flexible pool of assets that would help contribute to a modular, scalable force.

Comments and Recommendations

Transformation of the Army is a multifaceted problem with many possible solutions. Placing the platform at the center of transformation efforts will not meet Army transformation goals in the near term. Enhancing the platform with lightweight materials requires considerable research and development. Even then, survivability of the platform will require new sensor and network technology. Although networking technology is an attractive way to provide additional capability to ground forces, our research indicates that the technology required by mobile ground forces for these purposes is immature. Thus, Army reliance on information technology to insure the survivability and lethality of lightweight, mobile ground vehicles entails high risks. Failure has acute consequences. Ground vehicles and ground troops must bear the brunt of any deficiencies in the network.

Army reliance on information technology to insure the survivability and lethality of lightweight, mobile ground vehicles entails high risks

Deficiencies in current technologies do not negate the need to invest in advanced technologies, such as active protection and networks. On the contrary, the capabilities they provide are applicable to all Army ground vehicles.

As noted above, increased conventional protection can be obtained by allowing platform weight to increase. We believe that deployment of a network-enabled, 35-ton, ground vehicle, comparable to the Bradley IFV would provide a level of survivability with which most troops would feel comfortable, should the network fail. This hedge against vulnerability is important to allow troops to train confidently with the technology and develop the tactics to allow network-centric warfighting to reach its fullest potential. Operational engagements are not the time to experiment wholeheartedly, in option-sacrificing ways, with untested technologies that might go awry when confronted by the real world of wartime fog, friction, and surprise.

The natural response to removing the weight constraint is to question its impact on strategic mobility. However, as we indicated, increased platform weight will have little impact on the movement of large force structures. Further, the Army can achieve increased mobility using fast sealift and prepositioning equipment on land and at sea. Most importantly, mobility is not just about speed but also about the capabilities of what is being moved. We believe that restructuring the force will have a greater near term impact on deployability than introducing new technology for lightweight platforms.

Creating smaller units is an obvious way to reduce weight. The Army Chief of Staff recently proposed plans to create smaller, leaner brigades. His proposal addresses concerns about current readiness, not future force capabilities. Our proposal is bolder and entails greater restructuring.

In the coming years, the Army will be called on to deploy combat forces in varying sizes: battalions, brigades, divisions, corps, and multiple corps. Deployment problems are not the province of large forces alone; they can arise in trying to deploy a single brigade, or even a battalion. But, as Operation *Iraqi Freedom* shows, these problems arise with special magnitude when heavy, corps-sized forces are deployed. If the Army can acquire a better capacity to deploy swiftly one or two corps on a single occasion, it likely will be able to deploy smaller forces or larger forces at effective rates. Regardless of whether the term *corps* remains part of the vernacular, the Army will continue to anchor its planning on corps-sized operations and use this model as a basis for operating in big and small ways.

To conclude, we offer other recommendations for consideration to improve Army transformation. First, the Army needs to find a way to utilize spiral acquisition to meet the current initial operating capabilities of FCS. One way to accomplish this is to buy initial capabilities during research and development. This would allow earlier fielding, earlier concept development, and reduced integration risk. This approach has significant precedents, improves the rate at which new capabilities are developed and introduced, and has the benefits of managing the effort as a strategy, with all the flexibility that implies. Such a strategy could include a variety of combat vehicles with a variety of survivability features.

More attention needs to be paid to transforming the current force. This force has again demonstrated its importance in Iraq and warrants continued improvement as the core of the future sustainment force. This improvement includes adequate funding, the insertion of new technologies as they mature, and reorganization. Technologies that enhance human performance and provide greater protection to soldiers hold the promise of multiplying small-unit capabilities.

The Army needs to implement a total force restructuring to gain increased capability and reduce strain on high-demand units, including some in the Reserve components. There should be no sacred cows: not the Abrams doctrine, or even the active vs. reserve construct itself. While the Army needs to retain considerable firepower organic to the service, its transformation plans can be made more joint. The Army needs to embrace the mutually enabling capabilities derived from joint operations with aviation forces. For example, the Army should place greater emphasis on joint command and control. Nor should Army transformation rely primarily on new weapons systems. New combat formations and concepts, such as battle groups and joint rotational readiness, are at least as important.

In a strategic environment that will require the military to engage in expeditionary warfare more often than ever before, the Army will be stressed to balance its requirements for mobility, lethality, and survivability. Until now, much of the Army's focus has been on technology, particularly, the technology required for its so-called unit of action. But, as we have shown, simply replacing heavy platforms with lightweight ones does little to change the total weight of Army forces. The Army needs to give more thought to the organizational structures within which the technology will be used. Exploiting parameters outside a single platform enables a shift from thinking about a collection of platforms as an aggregated mass to thinking in terms of a system of systems. Similar thinking needs to be applied to organizational architectures. Only by considering forces in their totality is it possible for the Army to meet future challenges.

Notes

[1] *Army Transformation Roadmap 2003*, (Washington, DC: Department of Defense, April 2003), ix.

[2] Ibid., xi.

[3] In 1941, a 37–mm gun provided adequate lethality. But the M24 of 1945 carried a 75–mm gun and the M41A1 of 1953 carried a long-barreled 76–mm gun. The M24 weighed 40,500 pounds, while the M41A1 of 1953 was significantly heavier, at 51,800 pounds.

[4] M. H. Weik, *A Third Survey Of Domestic Electronic Digital Computing Systems*, Ballistic Research Laboratories Report 1115, March 1961, pp. 254–257. (http://ed-thelen.org/comp-hist/BRL61-f.html#FADAC, accessed December 9 2003.)

[5] S. Carey, M. Kleiner, M. R. Hieb, and R. Brown, "Development of a C^2 Standard of Task Representation for C^4ISR Systems, Simulations, and Robotics: Battle Management Language," 2002 Command and Control Research and Technology Symposium.

[6] S. W. Boutelle and R. Filak, "AFATDS: The Fire Support Window to the 21^{st} Century," *Joint Force Quarterly*, no. 11 (Spring 1996) 16–21.

[7] JTRS is a software based radio system under development as the primary radio for military communications.

[8] See http://www.defenselink.mil/nii/org/cio/gpmlinks.html and links listed (accessed November 4, 2003).

[9] http://www.nro.gov/PressReleases/prs_rel63.html (accessed November 4 2003).

[10] Douglas. A. Macgregor, *Breaking the Phalanx: A New Design for Landpower in the 21st Century* (Westport CT: Praeger Publishers, 1997).

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