AirLand Battle in the 21st Century
Colonel William M. Shepherd; HQ USATRADOC; Ft. Monroe

Key Words: AirLand Battle, Future Battlefields, Battlefield Damage Assessment and Repair (BDAR), Battlefield Maintenance Operations, Combat Resilience

Abstract

Just as the trends that describe the world of tomorrow have their roots in the world of today, the warfighting tenets of the future will evolve from those of today. AirLand Battle will develop to its full potential through the application of sophisticated and lethal new technologies combined with leaders and soldiers trained and qualified for operations on the future battlefield. This paper discusses the impact of the future battlefield environment on our ability to quickly repair and return critical systems to the fight.

Design requirements offer the potential of reducing critical repair periods and significantly increasing the combat power available to the battlefield commander. A battlefield consideration of design criteria is discussed from the commander's perspective.

Introduction

The purpose of this paper is to acquaint design engineers with the environment in which the U.S. Army must operate in the 21st century, so that they can include those features in new systems which the Army needs to perform its mission. I speak from the assumption that if the design engineer thoroughly understands his customer's problems, he is halfway there in creating solutions. Specific emphasis will be on our need for combat resilience and ease of Battlefield Damage Assessment and Repair (BDAR).

Periodically throughout history, the development of new weapons has changed the nature of warfare. In the not so distant past, the automotive engine replaced the Army's proud horses and mules, and added a new dimension to the battlefield. Today, the sophistication and types of modern weapons, land, air, nuclear, chemical, biological, directed energy, etc., are causing another such revolution, and introducing new dimensions to the battlefield. The Army's traditional role has been to gain and hold land and defeat enemy land forces. However, on the future battlefield, we must also contend with the airspace above the battle. The Army has developed a plan for the future and a strategy for the management of change as it evolves into the next century. Our concept is called "AirLand Battle" and emphasizes the integrated relationships of both air and land combat. The plan provides us with a balanced view of the future battlefield that enhances our strengths and capitalizes on the weaknesses of our adversaries.

I will first provide a brief description of the future battlefield, discuss some typical battlefield operations, and explain why combat resilience and BDAR have become so important.

The Battlefield of the Future

AirLand Battle seeks to exploit the full potential of U.S. forces by blending two concepts - attacking the entire enemy force to its full depth and synchronizing all available combat means (including those of the other services) to attain that end. AirLand Battle is based on securing the initiative and exploiting it vigorously to defeat the enemy force. We will be faced by an enemy possessing the most modern, lethal weapons known to man. But our adversary will also be armed insurgents or terrorists fully capable of engaging our modern systems with a variety of weapons across a spectrum of different scenarios. In the future, the propensity for armed conflict may grow, the weapons may become more lethal, the combatants may vary; but it is unlikely that the broad spectrum of warfare will become any narrower.

The battlefields of the 21st century, regardless of location, will have increasingly sophisticated combat systems possessing ranges, lethality, employment capabilities that surpass anything known in contemporary warfare. The airspace over the battlefield may be saturated with aerial and space weapons, and surveillance, reconnaissance and target acquisition systems. Conflicts will be devastating and intense, particularly at the point of decisive combat. Command and control, always the keystone of success in combat operations, will be exceedingly difficult. The world will see a steady proliferation of complex arms, to include the possible employment of nuclear, chemical and biological weapons. We can also expect to see new high technology weapons such as those involving directed energy.

If our forces are to survive and win on these future battlefields, they must be prepared to fight dispersed, concentrate combat power only when necessary for decisive action, and present a rapidly changing array of options to defeat the threat force. The Army of the 21st century must be a flexible, agile, robust, powerful force capable of conducting sustained and continuous combat operations in any environment. While the Army of the 21st century contemplates the employment of new and advanced systems, consideration must also be given to coordinating the employment of a mixed set of systems; the high-low mix family. This will require leaders capable of combining the potential of all available systems and able to provide the sustainment resources necessary to conduct continuous combat operations. With this background of the future combat environment, let us examine the Army's concept for the conduct of combat operations.

Our success on the future battlefield is closely linked with our ability to execute the basic tenets of AirLand Battle - Initiative, Agility, Depth, and Synchronization. It is imperative that we gain the initiative from the enemy early in the fight and retain it. History
shows that the victor in a battle is usually the side that can force its will upon the enemy and not allow him, once off balance to recover. To do this we must throw the enemy off balance with a powerful blow from an unexpected direction, follow up rapidly to prevent his recovery and continue operations aggressively to achieve the commander's goals. The best results are obtained when powerful blows are struck against critical units or areas whose loss will degrade the coherence of enemy operations in depth, and thus most rapidly and economically accomplish the mission. From the enemy's point of view, these operations must be rapid, unpredictable, violent, and disorienting. The pace must be fast enough to prevent him from taking effective counteractions.

This does not mean that we must be on the offensive all the time - the principle applies equally to defensive operations. When conducting defensive operations, units must look deep, diagnose the most probable enemy courses of action and avenues of approach, and deny the enemy employment options for his follow-on forces. AirLand Battle requires our forces to move fast, strike hard, and finish rapidly.

Figure 1. Effects of Interdiction

Figure 1 represents the enemy's capability to influence the fight at the forward line of troops or FLOT over time. The vertical axis indicates the enemy strength at the FLOT. As shown by the top line, enemy strength would continue to rise rather than remain constant if we fought only at the FLOT. Against a numerically superior threat force, this approach would spell defeat for our forces as combat would evolve into attrition warfare. If we interdict with air, special operations forces, and offensive electronic warfare then we reduce the enemy's capability as shown by the middle line. The bottom line indicates the potential offered by the combination of interdiction operations and the initiation of friendly ground offensive actions. Opportunities for friendly offensive actions are shown by the dotted vertical lines. If U.S. forces can create these windows of opportunity at places and times of our choosing, victory is possible. With AirLand Battle we are trying to make these windows occur when and where we choose.

This is a sequence (Figure 2) that might take place if an enemy force moving to join the battle had been detected in the corps' area of interest. Keep in mind that there is a battle going on at the FLOT and possibly another in our rear area. At this point the battle is essentially an air battle against critical enemy command and control and service support targets. The corps commander's objective is the delay and disruption of the enemy's momentum and formations in order to begin to create that window for friendly offensive action as the battle progresses. During this period the positioning of combat forces and combat power is critical to the execution of the commander's plan. It will also be apparent that the intent or objective changes as the fight progresses.
As the fight progresses into the brigade area (Figure 4), it is primarily a land battle supported by air assets. The window of opportunity previously discussed has arrived and the time for delay is gone. Brigades focus on the destruction of enemy combat power and the disruption of coordination between maneuver and supporting arms. It is important to remember that the actions at corps, division, and brigade are taking place in a dynamic and synchronized fashion. The brigade commander must bring to bear those resources required to defeat the enemy echelon in contact and prepare to attack the follow-on echelons.

Figure 3. The Division Battle

At 24 hours we get into the close-in fight (Figure 3). The focus is to disrupt by violent and continuous attacks the coordination of the enemy's maneuver and supporting arms, to inhibit his command and control and to reduce his ability to mass. Corps assets and air assets continue to attack enemy forces moving to join the battle. At this stage in the battle, it is imperative that the force commander have the capability to generate the maximum amount of combat power available to his force.

Figure 4. The Brigade Battle

As the fight progresses into the brigade area (Figure 4), it is primarily a land battle supported by air assets. The window of opportunity previously discussed has arrived and the time for delay is gone. Brigades focus on the destruction of enemy combat power and the disruption of coordination between maneuver and supporting arms. It is important to remember that the actions at corps, division, and brigade are taking place in a dynamic and synchronized fashion. The brigade commander must bring to bear those resources required to defeat the enemy echelon in contact and prepare to attack the follow-on echelons.

Figure 5. The Battalion Battle

The task of the combat battalion (Figure 5) remains what it has always been, to destroy or to defeat the echelon in contact. Battalions must seek out opportunities to do this - the nature of their defense should be offensive and the nature of their offense violent. It is the synchronization and commitment of all available weapons and supporting systems at this force level that will determine the outcome of the battle.

AirLand Battle presents implications for our long range planners that must be pursued to enhance our deterrent capability and battlefield potential. These implications include:

1. Prepare to Fight Anywhere - with the increased military capability of third world countries and Soviet power projections worldwide, we must be capable and prepared to fight anywhere and in all levels of conflict intensity.

2. Weapon Parity Dependent Upon Technology - it is not likely that we will be capable of matching the Soviets in numbers of systems and will depend on technology to maintain parity and look for those technological breakthroughs that provide the advantage to the United States.

3. Criticality of Initial Battles - in the past we have accepted the loss of initial battles in order to gain the time required to mobilize and deploy the forces required for final victory. In the future neither time nor resources will allow us to lose those initial battles. With the intensity of fighting and likely high combat losses, we may see early attempts at negotiated settlements, and
the side whose forces have won those initial conflicts goes into those negotiations in a much better bargaining position.

Our future force characteristics will also reflect changes needed to ensure victory on the battlefield. The Army of the 21st century must utilize mobile and maneuverable platforms that permit rapid movement unimpeded by man-made or natural obstacles. Weapons systems will be more lethal and have increased range with improved first round hit capability. Systems must be designed and built for continuous operations for extended periods of time on the demanding battlefield environment. Critical systems will require multiple capabilities so that when the primary capability has been rendered ineffective, an alternate capability exists to accomplish the task.

Battlefield Maintenance Operations

I have referred repeatedly to the new levels of sophistication in our new and coming weapons. In general, greater sophistication means greater performance, greater firepower, greater speed, etc. It also means greater consumption of ammunition, fuel, and other consumables. The requirements imposed on mobile battlefield supply, support, and other logistics functions have escalated by orders of magnitude.

We have developed the thesis that the entire theater is part of the battle. Only when the rear echelons are working in harmony, like cogs in a vast gear train, can the sophisticated weapons at the front attain the full performance capability needed to win the battle. You will recognize, as R&M engineers, that part of our challenge is to design the system so that no failure of a single cog, or probable critical combination of cogs, will bring this entire gear train to a stop.

![Figure 6. 3-Level Maintenance Support Structure](image)

Figure 6 is representative of maintenance operations for combat vehicles in a defensive scenario, as might be expected in a war in Central Europe. The defensive scenario is the worst case which determines the best disposition of maintenance battlefield. The Army of the 21st century makes the battlefield theater is divided into three support levels: Unit (organization of support); Intermediate (direct and general support); and Depot Support. These levels correspond roughly to the levels available to you for the maintenance of your car, namely: your filling station, local garage, and specialized overhaul shops. However, on the battlefield, maintenance is provided out of dispersed mobile shelters, exposed to the elements and the battlefield environment.

Unit maintenance encompasses the company and battalion areas, Intermediate direct maintenance takes place at the brigade, division and corps areas. Intermediate general support and depot maintenance is available at echelons above corps or rear areas. The major difference in these maintenance levels is the tools and facilities available. The heavier the tools, the greater their maintenance capability, but also the less mobile, and the further to the rear they must be located.

Figure 6 for maintenance is coordinated with similar figures for supply, transportation, manpower, and other logistics functions. However, the maintenance scenario best illustrates the problems I am trying to highlight. Similar sets of coordinated scenarios exist for other weapon systems. For example, the ones for combat helicopters are very similar, since our Army aircraft operate in close support of combat elements and their support facilities are often closely located. The aircraft maintenance levels are known as: AVUM for Aviation Unit Maintenance, AVIM for Aviation Intermediate Maintenance, and AVIN for Aviation Intermediate Maintenance, Depot Maintenance.

These figures, taken together, represent a dynamic situation. The operations in this and similar scenarios have been quantified, computerized, and studied extensively over the past decade. In a defensive scenario, with the front (FLOT = Front Line of Troops) moving from the right to left, there is only so much time left in each area before it is exposed to the effects of hostile forces. The average times available for support functions in a defensive scenario are as follows:

- Company area - 2 hours
- Battalion area - 6 hours
- Brigade area - 24 hours
- Division area - 36 hours
- Co-ps area - 48-96 hours

Among the trade-offs to be made is the location of heavy maintenance facilities versus availability of transportation. Transportation on a battlefield is always in short supply, and the provisioning of ammunition and fuel have priority.

The further forward the heavy maintenance facilities are located, the more accessible they are and the less transportation is required to bring damaged weapon systems to the repair facilities. On the other hand, in a defensive scenario when the need for ammunition and fuel is greatest at the front, forward heavy maintenance facilities will need more transportation to relocate them in a timely manner. The employment of back-haul transportation is one alternative employed. Such trade-offs are made on the basis of extensive computer simulations.

In combat the maintenance effort is directed at keeping equipment operating on the battlefield and returning it to service as quickly as possible. When a breakdown occurs in a weapon system at the FLOT, the first contact is made by a maintenance contact team (MT) sent forward from an organizational maintenance platoon at the battalion level. The maintenance contact team will include an assessor who will make all the necessary
decisions required to restore the system to some required level of operational capability as quickly as possible, or provide for other disposition as indicated. Some of the options are:

- Defer repair - release weapon for restricted or unrestricted combat.
- Repair on site - If the repair requirements exceed the capability of the maintenance contact team, the assessor may call for the help of a maintenance support team (MST) with direct support capability from the maintenance company in the brigade rear area.
- If on-site repair is not feasible, the system may be recovered or evacuated.

Depending on the extent of the damage, the system will be recovered to the unserviceable equipment rally point (UERP) or maintenance collection point; repaired as required; and returned to the owner.

If the damage is too extensive, the equipment is evacuated to division, corps, or higher maintenance level in the rear. In case of evacuation, the commander loses ownership of the weapon system which is returned to the supply system when fully restored. The losing commander will draw a new weapon system from the supply system when one becomes available.

Damaged systems should never be abandoned on the battlefield, since they can almost always be restored to some useful level of operational capability. However, if no possibility of recovery or evacuation exists and abandonment is unavoidable, all usable parts should be cannibalized and whatever is left behind should be destroyed or rendered unserviceable.

The need for BDAR and combat resilience

Peacetime maintenance differs significantly from wartime maintenance. The objectives of peacetime maintenance are:

- Servicing - maintaining a weapon system in a fully mission capable condition.
- Repair - restoring damaged weapon systems to a fully mission capable condition.
- Overhaul/Modification - restoring weapon systems to fully mission capable condition/enhancing capability.

Peacetime maintenance is performed under controlled conditions, with qualified personnel using approved parts and standard procedures. As much time is taken for repair as is necessary to do an acceptable job.

The mission of battlefield maintenance is to enhance the force's capability to win the battle. Another set of priorities apply. Time is a major consideration. The objective is to restore quickly incapacitated weapon systems to some required level of capability with the resources available on the battlefield, and return them to battle where they can still help win the fight. The first unit available who knows how can perform the repairs and use any available materials and procedures that will work.

In 1982 the Army instituted a Battlefield Damage Assessment and Repair (BDAR) program for the purpose of recording expedient battlefield assessment and repair procedures in a set of technical manuals. Some 8 of these manuals on major weapon systems have been published, and others are in preparation. The material in these manuals is being introduced into the curricula of Army schools. BDAR may only be used in wartime at the discretion of the commander.

The effect of BDAR on the conduct of a battle is astounding. Figure 7 is typical of the results of a very extensive computer tank battle simulation conducted by the German army to determine the advantages of quick battlefield repair. The left hand solid black sloping curve shows the losses that would occur in a conventional battle without replacement of destroyed tanks or expedient battlefield repair of damaged ones. This is typical of a tank battle, where the two sides attack each other for up to 24 hours until most of the tanks on both sides are incapacitated. Then they break contact for resupply in preparation for the next battle.

In the same figure, the upper curve shows the effect on availability of the replacement of irreparable tanks and of quick battlefield repair. The lower curve shows the effect of battlefield repair only. The curves show that shortly after the replacement and battlefield repair program takes effect, a consistent force of about 70% of the original force can be sustained in the field for an extended period of time. It is noteworthy that in combat, not many tanks are irreparably damaged and their replacement is not a significant factor.

Although this figure is the result of a computer simulation, it provides an explanation for a number of examples in military history where the side that skillfully applied expedient battlefield repair techniques achieved unexpected victory, sometimes against substantial odds. The U.S. and its NATO allies are confident that BDAR can provide us with the edge needed to withstand the numerical odds we face in conventional weapons in Central Europe.

However, our experience to date with BDAR and especially in the German/U.S. Joint Live Firing Trials at Meppen(1) has pointed out a glaring deficiency in our weapon systems: they are not designed for quick battlefield damage assessment and repair. This does not appear to be a consideration to which design engineers in the past have given any special thought. To overcome this deficiency, the Army is now formulating a new design requirement, namely for combat resilience, defined as a weapon system characteristic which permits an incapacitated weapon system to be unavailable.
quickly restored to some needed, useful, possibly degraded operational level of capability, with the expedient resources available on the battlefield. The concept involves two factors: The first is quick and accurate assessment, and secondly the quick repair itself.

Our studies show that if a weapon system requires more than 24 hours to restore it to some needed level of mission capability, its usefulness is lost with respect to the ongoing battle and it should be evacuated to the rear for regular repair. Ideally, BDAR refers to the unit maintenance level of Figure 6 where restoration is accomplished with the resources of the maintenance contact team and maintenance support team within 2 to 6 hours. After the emergency is over, BDAR repairs should be fixed by standard procedures.

As mentioned before the entire theater is part of the battle, with many cogs operating as part of a vast drive train. The enemy's theater will be much the same. Part of our strategy includes the use of forces which can be inserted in the enemy's rear to destroy his logistics support system. Such units could make an important contribution to winning the battle. They must be self-sustaining and cannot count on any outside support for some period of time. If their equipment fails or breaks down, they must fix it themselves with whatever resources are available or can be scavenged.

The Army still has to learn to quantify combat resilience and introduce it as a hard, demonstrable requirement in development contracts. In the meantime, we ask design engineers to be aware of the requirement. We believe that designers have to start with the premise that their weapon systems will be damaged in combat. They should understand the threats and the operating and maintenance environments I have described. If they do, we hope that they will respond with proposals which will multiply our combat effectiveness.

With respect to assessment, it must be remembered that the maintenance contact team assessor is alone on a vast battlefield and does not have any sophisticated test equipment at his disposal. Hence, weapon systems must be designed such that assessment of damage can be performed quickly, using the tools available in the team's tool set.

Summary

Our potential adversaries enjoy an overwhelming numerical advantage in conventional forces and weapons. If we are to provide a credible deterrent, we have to think and fight harder, enhancing our strengths and exploiting the threat's weaknesses. The Army is responding with new concepts, including the AirLand Battle. I have described to you in some detail how we are planning our ground maintenance operations within the AirLand Battle concept in the 21st Century. In the course of our studies we have discovered that quick, expedient battlefield repair is an astonishingly powerful force multiplier, in effect providing us with a replacement for each system lost in combat, and giving us an opportunity to continue the attack after hostile forces have lost their initial numerical advantage.

However, we have also discovered that our weapons are not designed to be quickly restored by expedient resources available on the battlefield. We are formulating a new design requirement called combat resilience. Until we can get this requirement quantified and included in our development contracts, we are asking our contractors to study the problem and include whatever provisions they can in their new designs which will make our combat systems more combat resilient!

Reference


Biography

Colonel William M. Shepherd
HQ U.S. Army Training and Doctrine Command
Office of the Deputy Chief of Staff for Doctrine, ATDO-P
Fort Monroe, VA 23651-5000

COL Shepherd is the Director of Concepts and Future Planning. COL Shepherd joined the Army following graduation from Virginia Polytechnic Institute with a BS in Geology. He also holds a MS in Civil Engineering from Clemson University. His responsibilities include management of the Army's futures planning program formulating concepts for Army operations in the 21st Century and implementing transition strategies. He is a member of the Society of American Military Engineers, American Society of Civil Engineers, and the World Future Society.