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ARMOR UTILITY IN THE FUTURE

BY

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mobility, survivability, and sustainability. Armored missions are reviewed and examined to determine the necessity of armored forces as part of the combined arms team of the future. Offensive action, support of infantry and the cavalry continuation of reconnaissance and security are included in the discussion. Armor units and organizations are integrated into the examination of the combined arms. As the U.S. enters the twenty first century, the type of vehicle requirements are developed with the additional criteria of rapid strategic deployment and the impact of new technology. These challenges require a world wide focus with a balanced flexible force structure. In the final analysis armored forces contribute to this balance and provide the combat arms of the future with continuous offensive combat capabilities.

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ARMOR UTILITY IN THE FUTURE

AN INDIVIDUAL STUDY PROJECT

by

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ABSTRACT

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As the twenty first century approaches the Army will be faced with many challenges. The apparent reduction of the Soviet threat will tend to destabilize the east-west bi-polarity and will give rise to a multi-polar world with possible regional threats. Conflict can be expected across the spectrum, but will most likely be from low to mid intensity. Economic pressures will cause a decrease in the levels of defense spending. There will be a reduction of forward deployed forces and a significant reduction in the total end-strength of the U.S. Army. In this environment, the primary mission of the Army - the projection of land combat power anywhere in the world will take on an increasing significance to ensure a continued viable deterrent. These requirements, together with the technological advances of other tank killing systems on the battlefield contribute to the debate that armor will have little utility in future conflicts. This paper briefly examines the future threat and evolving U.S. doctrine with the implications that each have on armored forces. The main battle tank is analyzed in terms of the capabilities that can be measured; lethality, mobility, survivability, and sustainability. Armored missions are reviewed and examined to determine the necessity of armored forces as part of the combined arms team of the future. Offensive action, support of infantry and the cavalry continuation of reconnaissance and security are included in the discussion. Armor units and organizations are integrated into the examination of the combined arms. As the U.S. enters the twenty first century, the type of vehicle requirements are developed with the additional criteria of rapid strategic deployment and the impact of new technology. These challenges require a world wide focus with a balanced flexible force structure. In the final analysis armored forces contribute to this balance and provide the combat arms of the future with continuous offensive combat capabilities.

Armor is more than a branch. It is a state of mind whereby a balanced team of arms and services work together in a climate of equal importance and equal prestige.

GEN Bruce C. Clarke¹

This statement made by General Clarke is almost immortal in explaining the underlying fundamentals for utilization of the combined arms team. The concept of combined arms is that more than one combat arm, weapon or weapons system is employed to complement and supplement the effect of the other on the battlefield, providing mutual support while at the same time minimizing each others vulnerabilities.² Combined arms operations in the Army, structured on the factors of mission, enemy, terrain and weather, troops and time available (METT-T), are considered to be the employment of Infantry, Artillery, Army Aviation, Air Defense, Engineers, Close Air Support and Armor, optimizing total capabilities to close with and destroy the enemy. This combining of arms provides a synergistic effect of all forces employed in such a way to enhance the capabilities of the other while providing the enemy no weakness to exploit.³ Included in this concept are combat support and combat service support arms as well. They provide the critical logistics, maintenance, medical and service functions to those elements in combat thus contributing to the total effect. Armor has always been a combined arms concept, because of the integration of forces through task organization, where no one arm is deemed more important than

another. For no one arm or service can win by itself or for that matter even survive in combat.

As the twenty first century looms on the horizon and the Army is faced with reducing its forces, rumor abounds that armored or heavy forces will be stricken from the combined arms team. This stems partially from the Army's emphasis placed in the past decade on the need for light forces in low-intensity conflicts and the light infantry divisions that were created beginning in the mid 1980's. Serving as a further catalyst, the soviet threat appeared to rapidly diminish in November 1989 through the fall of the iron curtain, the crumbling of the Berlin wall and the beginning of the disintegration of the Warsaw Treaty Organization. The Soviet threat was made even more remote by the internal difficulties experienced by the Soviet Union in terms of economic collapse, civil unrest and threatened secession by some of their republics. As the decade of the nineties dawned there was a general euphoria within and without the defense community that the policy of containment had indeed worked, the Cold War had been won. A "peace dividend" could now be made available through drastic cuts in the defense budget which would result in a substantial decrease in the size of the armed forces. The analogy being that at the conclusion of a war demobilization follows. The Army Times told of massive personnel and equipment reductions, with Armor suffering apparently disproportionate losses.⁴ On Capital Hill the rhetoric disclosed a perception that Armor was no longer required, there would only be a need for light

forces in the future.

Thus, the forces that appear to have been targeted for the most significant reductions are armored forces. This conclusion is reached by following a logical path that the soviet threat is minimal, future conflicts will be regional, centered around third world countries and will tend to be low-intensity in nature. Therefore because large armored formations will not be encountered, the military does not require tank killers in the form of tanks or armored weapons systems. Any necessity to destroy tanks could be achieved by anti-tank weapons, attack helicopters or air power. This is a plausible line of reasoning that must be considered seriously. Faced with increases in technology and a reduced force, is there a need to retain armored forces in the United States Army in the twenty first century?

As the world was beginning to take some comfort in the fact that the Cold War was over and was grappling with a new world order, Iraq invaded Kuwait. A few days later Coalition and United States forces responded with operation Desert Shield. Initially the mission was to defend Saudi Arabia from attack by Iraqi forces. As the massive build-up of U.S. and Coalition forces took place in the Middle East through the fall and winter, the information still forth coming was that as soon as Desert Shield was over the Army would start to build-down. During that same time frame, many senior leaders of the Army indicated armor or heavy forces would be drastically cut from the force structure. As Desert Storm commenced in the early

hours of 16 January 1991 the United States had half a million personnel in the Middle East plus six carrier battle groups and two battleships in the Red Sea or Persian Gulf. The U.S. Army alone has deployed two corps in Saudi Arabia with the equivalent of almost eight combat divisions and all the necessary combat and service support elements to support a field army.

Although the threat of general war in Europe has greatly diminished with the collapse of the Warsaw Treaty Organization, Operation Desert Storm has vividly demonstrated the necessity of retaining highly lethal, mobile and survivable offensive capability within the Army in the form of Armored forces. The methodology used in this study will be to critically scrutinize four major areas involved in determining the utility of armored forces in the future; the threat, doctrine, organization and material. Each of these areas will be analyzed in the context of the direction the Army is moving: with reduced forces, a forward presence in Europe, contingency forces and requirements throughout the spectrum of conflict.

Challenge of the Future: The Changing Threat

The challenge of the future will be to characterize the changing nature of the threat, understand the growing lethality of warfare and identify potential areas of U.S. involvement. The demise of the Warsaw Pact has eased east-west tensions, but at the same time tended to destabilize the east-west orientation of the major world powers and allows for the rise

of regional powers. However, as the world wide situation is examined to assess potential threats to U.S. interests, it is paramount to realize the only country which has the capacity to neutralize the United States is the Soviet Union. The secretary of Defense recently told the house armed services committee, "They (the Soviets) remain the one nation in the world that has the capability to destroy the United States."⁵ The post-Cold War era has been ushered in with prospects for a Conventional Forces Europe Treaty and multi and unilateral force reductions. Despite the decrease in U.S. and Soviet tensions, the Soviet Union still continues to modernize its forces and remains the most credible threat to the interest of the United States.⁶

It is expected that a multi-polar world will develop and countries within each region of the world will vie for power or influence within their respective regions. If countries striving for power within each region can not resolve their differences through political or economic cooperation, then the potential for use of the military element of power is increased and conflict becomes likely. Therefore, the United States security planners must remain cognizant of the Soviet threat and also shift the defense focus to include emerging regional threats.

This focus can be easily achieved by dividing the globe into regions or areas of concern. A world wide assessment has been conducted at the U.S. Army Armor Center which examined and identified potential threats to U.S. interest that may

result in U.S. involvement. Six major global regions considered were: North America, Latin America, Europe, Africa, Middle East/Southwest Asia and Far East/Pacific Rim. An analysis of nations by region was then conducted examining their political, economic and social stability. International relationships were scrutinized looking at each countries' foreign relations, organization membership and potential for disputes. Lastly, the military capability of each nation within the region was studied. The resultant assessment summary yields two categories, one where conflict is possible and the other where conflict is most likely. There are four regions this assessment shows where conflict is most likely to occur: Latin America, Europe, Africa and the Middle East/Southwest Asia.⁷

Although the Far East/Pacific Rim region is not included in the regions where conflict is most likely it contains such countries as China, North Korea, Myanmar, Philippines and Vietnam where conflict is possible. The Far East/Pacific Rim and Middle East/Southwest Asia regions have the highest concentration of nations with existing ballistic missile inventories or development programs.⁸ Proliferation of these weapons systems directly impact on the United States. Currently U.S. forces deployed in Saudi Arabia are within range of Iraqi modified Scud B missiles as is the U.S. airbase at Incirlik, Turkey.

The growth in lethality of warfare tends to be highlighted by the number of countries which are attempting to achieve

nuclear, chemical or biological warfare capabilities. There are relatively few countries which possess nuclear weapons. Only a handful have a development program or weapons stocks and the ability to deliver them. Those that have detonated nuclear devices are; the United States, Soviet Union, China, France, United Kingdom and India. It is believed that Israel, South Africa, and Pakistan possess nuclear weapons. Several other nations; Iraq, Argentina, Brazil, North and South Korea and Taiwan may be able to field nuclear weapons by the turn of the century.⁹

Chemical weapons have recently been referred to as a poor man's nuke. Mustard gas (a blister agent) and Phosgene (a choking agent) are relatively simple chemical agents and can be produced with relative ease by nations possessing existing petroleum refining, pharmaceutical, fertilizer or insecticide industries. Nerve agent production requires a greater technological sophistication than either mustard gas or phosgene and therefore restricts many lesser developed countries from manufacturing them. Iraq is the only non-NATO or Warsaw Treaty Organization power known to possess chemical weapons. There are a number of nations that probably possess chemical weapons. These include; Myanmar, China, Iran, North and South Korea, Syria, Taiwan, Vietnam, Egypt, Ethiopia, Israel and Libya.¹⁰

Acquisition of biological warfare agents capable of being employed as strategic or tactical weapons require a degree of technological sophistication greater than that required to produce chemical weapons. Biological agents such as anthrax

are as much as one hundred times more lethal than VX nerve gas per kilogram of weapon. Adequate containment, handling and production facilities to process the biological agents into a deliverable munition are resident only in more developed countries. A more plausible use of biological warfare agents is as a culture clandestinely introduced by terrorist or covert forces. This technique would not require the technological sophistication noted above. Given adequate environmental conditions and time to incubate, the impact of a biological warfare attack on a population center or rear area could be devastating. Iran, Iraq, Syria and North Korea are believed to have ongoing biological warfare research and development programs as well as existing weapons stocks.¹¹

The following table lists countries in each region that may pose a threat to U.S. interests and indicates the number of main battle tanks each country possesses followed by the number of light tanks, tank destroyers or assault/armored gun systems. In all cases the number of armored personnel carriers or infantry fighting vehicles (not shown) possessed by these countries exceed the number of tanks.¹²

<u>Latin America</u>	
Cuba	1100/260
Nicaragua	130/94
Peru	350/221
<u>Europe</u>	
Soviet Union	53,580/4,870
<u>Africa</u>	
Angola	
Chad	
Mozambique	150/50
Nigeria	130/350
South Africa	250/1600

<u>Middle East/Southwest Asia</u>	
Afganistan	620/60
India	3150/100
Iran	500/160
Iraq	5500/500*
Lebanon	100/100
Syria	4140/500

*Prior to Operation Desert Storm

In the twenty first century the diversity and lethality of weapons systems available to nations will expand. Armored fleets are likely to increase and modernize as regional powers engage in arms races for regional supremacy. The largest flow of arms has been into the Middle East with Iraq as the largest importer followed closely by Saudi Arabia and Syria. If the Warsaw Pact countries continue their transition to free market economies, their weapons will become increasingly available to other nations in return for much needed currency. Furthermore, indigenous arms manufacturing capabilities in developing nations will provide the market with weapons of a technological sophistication that previously had only been found in NATO and Warsaw Treaty Organization armies.¹³

The projection of armored force requirements into the regions where potential conflicts are likely shows a combination of employment scenarios. In the Middle East/Southwest Asia region, light armor forces are initially required for rapid response insertion to defend, stabilize a crisis or assault and secure an air or beach head. Heavy armored forces will be required to follow on in order to provide adequate lethality, mobility and survivability to defeat substantial armored or ground forces. Armored forces are not likely to be committed

in Africa. It is possible that light armor would be used for rapid response or in the multi-national peace keeping force mission. Europe will still require heavy armor forces to defend our NATO commitments. Latin America may require the use of light armor in a rapid response role, but only in Cuba would heavy armored forces be required to provide adequate lethality to defeat a substantial threat.¹⁴

The Middle East/Southwest Asia scenario depicts a parallel to deployment of forces for Desert Shield/Storm. Light forces were followed by heavy. The light forces, including one light armor battalion, were initially deployed by airlift to defend. If Iraq had engaged in immediate offensive action the light forces deployed would most likely have had little effect. The need for light armor for rapid response to stabilize and defend while waiting for heavy forces is correctly identified in the scenario, but one light armor battalion in this case would have been insufficient. The need for follow on heavy armor was also correctly identified. During Desert Shield/Storm the United States was allowed sufficient time to deploy a large number of heavy forces. The lesson learned should be that on the next occasion, the U.S. will not be allowed that much time to deploy heavy forces. There is no disagreement with the scenarios for Africa and Europe. However, the scenario for Latin America might also require heavy armor forces to be deployed to Peru or Nicaragua.

This world wide threat assessment reaches a number of conclusions. First, the threats to the national interest

are dispersed around the world with a variety of potential enemies emerging from regional power struggles. Second, conflict is possible across the spectrum - low, mid and high.¹⁵ "Although low and mid intensity conflicts are most likely during the 1990's and beginning of the Twenty-First century."¹⁶ Third, there is also the increasing potential for nuclear, biological and chemical warfare. Fourth, every region has nations with modern armor and last, the Soviet Union is still the most lethal of the potential threats.¹⁷

There is no doubt that the Soviet Union will constitute the most lethal potential military threat to the United States' worldwide interest through the last decade of this century and the opening decade of the Twenty-First century.¹⁸

However, in the future the continuing proliferation of modern weapons and the growing number of developing nations will result in a multi-polar world with diverse threats, possessing increasing lethality and located in almost every region of the world. Armor, as an offensive weapon in the combined arms team will participate in all but the lowest of intensity conflicts. The United States will be required to develop and maintain contingency forces with the flexibility to defeat the full spectrum of threats projected to be present by the turn of the century.

Doctrine: AirLand Battle-Future

As the Army looks to the future with the expected changes in the threat and evolving national interest, it must develop

the capabilities to execute its missions as part of the total U.S. military strategy. Airland Battle-Future is a series of studies in which the Army is trying to determine the changes necessary in doctrine, organization and equipment. In the simplest form doctrine guides the training, structure and equipping of the force. Current Airland Battle Doctrine is set forth in FM 100-5, Operations, May 1986. The Airland Battle-Future (ALB-F) concept links future Army force capabilities with projected national security interests and strategy. This establishes a benchmark for moving the Army into the future, using Airland Battle (ALB) Doctrine as the foundation for combat operations.¹⁹ To provide a general understanding of the Airland Battle-Future concept, a quick overview is necessary. Some aspects of the future doctrine will remain the same, ALB-F is still focused at the operational level and oriented on a U.S. Army Corps. The basic tenets of initiative, agility, synchronization and depth are still inherent in the operational and tactical doctrine of the future. Leader training will stress more than ever initiative, decisiveness and risk taking. There is an important, subtle difference between ALB and ALB-F. Current ALB doctrine envisions linear warfare that becomes non-linear when opposing forces are intermingled. ALB-F envisions forces employed initially in a non-linear configuration.²⁰ Characteristic of the ALB-F battlefield are fewer forces and large gaps between forces, creating the non-linear conditions. Commanders will use maneuver warfare to mass, focused on the destruction of the enemy forces.

Although the fight will still be deep, close and rear the corps area of operations will be renamed the detection area, battle area and tactical support area. High technology sensors will be used to locate and track the enemy in the detection area. Rapidly moving, highly mobile reconnaissance and cavalry forces will confirm the sensor track. The Corps Commander, with almost perfect knowledge of the enemy will shape the battlefield and set the battle at his time and place of choosing. There will be an increased reliance on close air support, long range fires (ATACMS, MLRS) and attack helicopters to initiate the engagement, attrit the enemy force and seek to destroy it. Finally rapidly converging combined arms teams will finish the destruction of the enemy force. When this is complete friendly units will disperse, reconstitute and reset. ALB-F divides the concept into four stages. Gaining and maintaining the initiative is a prerequisite throughout all four stages of combat operations (reference the tenants). Stage I is the "detection/preparation" phase where initial preparation of the battlefield takes place and the enemy is found using detectors and verified using cavalry assets. During stage II "conditions for decisive operations" are established by shaping the battlefield with aviation assets, long range fires or economy of force assets. Stage III is the "decisive operations" phase, which must be highly synchronized to bring maneuver forces together at the decisive place and time to strike the enemy a decisive blow. Stage IV is the "recovery/ reconstitution" phase where friendly

forces disperse, reset and recock for future operations as the cycle repeats.²¹

On a wide-spread, dispersed battlefield greater importance will be placed on accurate intelligence, reconnaissance, security and target acquisition tasks. Additional assets will be required in the form of high tech sensor/detector systems and reconnaissance (cavalry) organizations. ALB-F advocates formalizing the brigade "slice" into a combined arms brigade, restructures the division somewhat, increasing cavalry and engineer assets. A corps is thought to require an additional armored cavalry or air cavalry regiment. Because maneuver forces will be required to rapidly close with and destroy the enemy, the case for improvement of combat vehicles is well documented. They must be able to destroy the enemy forces as well as survive the close fight. An important premium is placed on the main battle tank, infantry fighting vehicle and armored engineer vehicle. Continued modernization of armored systems and development of the light scout-attack helicopter is deemed essential.²²

ALB-F develops the position that forces will be smaller in the future and that national security strategy will change the emphasis on where they are stationed and the capabilities they should possess. Future forces will be composed of five types; contingency, forward presence, reinforcing, nation assistance and unique mission.²³ The new reality of Desert Shield and Desert Storm emphasizes the Army's primary mission of the future. The projection of land combat power from anywhere

in the world to anywhere in the world. This will require rapid response with forces tailored to balance deployability and lethality.

Organize To Operate: The Changing Force Structure

Changes in the threat and changes in doctrine will demand that there be changes in force structure. Coupled with these changes is the President's 1990 National Security Strategy concerning conventional forces "...as we look to the future, we see our active forces being smaller, more global in their orientation, and having a degree of agility, readiness and sustainability appropriate to the demands of likely conflicts."²⁴ All of these in concert will provide the guidance necessary to facilitate the changes in future force structure.

The first changes that we heard about as the Soviet threat diminished in Eastern Europe was that heavy forces must go the way of the dinosaur. The reduced threat and the projected reduction in defense spending has caused congressional staffers and some military analyst to predict that there would be little need for heavy forces. Heavy forces in this context refers to organizations equipped with armored vehicles of all types including tanks, infantry fighting vehicles, and self propelled artillery. The heavy force is now built around the M1 tank and the Bradley fighting vehicle. Some say Armor is dying.²⁵ Some suggested that heavy forces be placed totally in the reserve components.

However, analysis of the future threat and analysis of our future doctrine reveals that heavy forces and armor will not die for quite sometime. Before it is decided that armor should go the way of the dinosaur, the roles and missions of armor should be reviewed as well as the reasons why armor was invented in the first place.

The tank was created in World War I to provide support for the infantry as an impetus to break the stalemate of trench warfare. The support mission was accomplished through mobile fire power while at the same time providing protection for the crew. After World War I the armor forces were disbanded. There almost seems to be a parallel feeling on the utility of armor between the post-World War I era and the post-Cold War era.

In the 1930's both infantry and cavalry branch experimented with mechanized forces under the auspices of each branch. Infantry branch of course looked at armor in the infantry support role, while Cavalry oriented more toward rapid movement and mounted combat. Neither branch was very serious in advocating mechanization because both the Army and the budget were extremely small. In the late 1930's the 7th Cavalry Brigade (Mechanized) was finally organized. However, Cavalry Branch officially still did not desire proponentcy of armor forces because to do so would sacrifice horse mounted units and expansion without conversion was impossible due to budgetary limitations. Meanwhile the continent of Europe exploded in a new kind of war, events and far sighted leaders drove the

creation of an armor force separate from both the infantry and cavalry in June of 1940.²⁶

During World War II armor, infantry, artillery and close air support developed into the "Combined Arms Team". The tank was used in two basic roles. The original mission of support for infantry units was unchanged and separate tank battalions were organized to provide support to infantry divisions. Armored divisions were organized into combat commands usually composed of a tank battalion, armored infantry battalion and an armored artillery battalion. These armored divisions keyed their actions on their offensive capabilities and stressed speed, firepower and shock effect using the tank as a tactical weapon in its own right.

In the aftermath of World War II, Army studies concluded that the best anti-tank weapon was a better tank.²⁷ This was a significant change in philosophy from earlier in the war where anti-tank guns and tank destroyers were thought best to defeat a tank. During the following decades tank killing has become a major role of the tank. The types of ammunition for tank main guns are either kinetic energy or high explosive anti-tank, a chemical energy shaped charge. Both are designed to defeat heavy armor systems. In the target rich environment expected from the Soviet threat, U.S. tanks would have to concentrate on destroying great numbers of Soviet tanks. Tanks, in effect, have become almost exclusively tank killers.²⁸

Vietnam witnessed the introduction of increased technology

into the Army. Most notable was the massive use of the helicopter. Doctrine changed, air mobility was used to assault and transport infantry and artillery. Air cavalry became an extension of ground reconnaissance and use of the attack helicopter was conceived. After Vietnam technologies evolved toward improved anti-armor weapons systems. Light antitank systems were developed that improved the capabilities of the infantryman to fight armor. Anti-tank guided missiles were developed that could be fired from ground mounts or attack helicopters. Artillery and aerial delivered area munitions were designed with anti-armor capabilities, as well as laser guided projectiles and smart bombs for precision fires on individually designated targets. Attack helicopters and fixed wing platforms were built with the specific purpose of killing tanks. The most recent and revolutionary development in the anti-armor weapons system category has been the testing of the kinetic energy missile, mounted on a modified armored vehicle platform. This system called the Line of Sight Anti-tank (LOSAT) will mount four missiles on a medium weight chassis. It is experiencing some problems with accuracy during developmental testing.²⁹ However, when perfected this system will be very significant, because previously anti-tank weapons systems technologies had been confined to chemical energy munitions. Only the tank main gun had the capability of firing kinetic energy, long rod penetrators at other main battle tanks. From the scientific perspective it is much easier to design armor protection to defeat only one type of munition

rather than both chemical and kinetic energy munitions.

With all of these anti-tank systems on and above the battlefield, does that make the tank obsolete? Is the tank even necessary on the modern battlefield? Current U.S. doctrine (AirLand Battle) and future doctrine (AirLand Battle-Future) seeks to counter mass-momentum combat in mid to high intensity conflict. This is accomplished by taking the initiative away from the enemy through swift, violent and aggressive combat. The main battle tank is the foundation of mounted offensive combined arms operations that are essential to defeating an enemy. The effectiveness of threat anti-tank weapons systems are successfully degraded by fighting within a combined arms team. U.S. Doctrine is offensively oriented, armor is the stimulus for that orientation. Future U.S. doctrine emphasizes the requirements for a family of armored combat vehicles oriented around the future main battle tank.³⁰

Furthermore, when considering all the weapons systems on the battlefield, the tank is the single most effective system. No other system possesses the fire power, mobility and survivability of the tank. This is especially true when considering the capabilities and effectiveness of all other weapon systems as measured in the areas of lethality, mobility, survivability and sustainability. Highly lethal, the tank main gun is a high velocity, direct fire system that is extremely accurate to 2000 meters. It fires either kinetic energy or chemical energy ammunition that is capable of penetrating any threat target on the battlefield. When penetration is

achieved the effects are violent and catastrophic. Secondary armament is the caliber .50 and 7.62mm machine guns with effective ranges to 1600 and 1000 meters respectively. The machine guns are necessary to engage and destroy thin skinned targets and dismounted troops.³¹

There are a number of factors which influence mobility, vehicle weight, suspension system, track design and power plant to name a few. The current main battle tank sets the standards for cross country mobility on the battlefield. All other systems are being designed to keep up with the tank. The M1 series tank can sustain cross country speeds of 30 miles per hour, climb a 60 per cent gradient, negotiate a three and a half foot vertical obstacle, cross a nine foot ditch and perform a 360 degree pivot steer within its own length. There are areas of the globe where terrain is restrictive to the employment of vehicles, particularly rugged, mountainous or close terrain. However, generally speaking tracked vehicles can traverse ground which is impassable to wheeled vehicles.³² The automotive system of the current main battle tank affords it great cross country speed and maneuverability. This provides the flexibility and agility required of combat elements in consonance with current and future doctrine. The limiting factors in mobility, both strategically and tactically, are weight and size. Prudence would dictate that at 70 tons the current main battle tank has about reached maximum weight limitations. Further increases in weight would probably begin to hamper tactical mobility.

Strategic mobility is constrained by weight and size of equipment or cargo to be moved and the assets available to move that cargo. Strategic lift assets are limited, thus the reasoning behind pre-positioning stocks. Strategic airlift is unproductive for moving main battle tanks because of their size and weight. Although it is possible for a C-5B Galaxy to lift a tank, this is an extremely inefficient method of movement. One sortie per tank is not practicable from both the aspect of a large unit deployment and aircraft utilization. The aircraft available capable of lifting a tank would allow for only a small number of tanks to be airlifted during a major deployment. If tanks were required to deploy with a light infantry division then most likely only a small unit could be airlifted, perhaps a battalion. This will probably remain true even with the introduction of the C-17. Planners must accept sealift as the appropriate method of moving armored or mechanized organizations to the theater of operations. A factor in the design of tanks and other military equipment should be compatibility with size and weight constraints of strategic lift assets. Likewise, strategic lift assets, sealift ships and aircraft should be designed to accept outsized military equipment. Once in the theater tactical mobility can easily be restricted by size and weight as well. If tanks exceed rail car width, highway, bridge and overpass limitations then getting them to the battle area will be a serious problem. The mobility challenge in the future will be to retain cross country maneuverability and reduce the gross weight.

Specialized armor ensures the tank is the most survivable system on today's battlefield. It cannot be defeated by many anti-tank missiles and the design of interior ammunition storage areas reduce overall vulnerability.³³ Armor protection affords crew survivability and the capability for the tank to continue to fight. Survivability is also a function of the two most important aspects of design, lethality and mobility.

The tank is able to sustain continuous combat operations. Thermal sights permit the crew to continue to fight during periods of limited visibility such as smoke, dust, haze, fog and darkness. Changing battlefield conditions do not affect the tank, it can continue to operate in a nuclear, biological or chemical environment without degradation. Other weapons systems may have a greater degree of capability in one or two of the specific areas, but do not equal the capability of the main battle tank across the board in all areas. Through their capabilities and limitations all these weapons systems complement each other, but they can not replace the tank.³⁴

The essential reason the main battle tank is necessary is because it is a twenty four hour a day, all weather, continuous combat system that can fight under any conditions. Tanks can operate day or night, during extreme weather; in blowing snow or driving rain, in mud or sand and severe heat or cold. Most important, only tanks and infantry can attack to seize and hold terrain! Only tanks are capable of surviving indirect fires to continue the fight. After the combat multipliers have been applied, when the fires are lifted and

shifted, it is ultimately tanks and infantry which will close with and kill the enemy. Other combined arms assets should be integrated into the overall plan, especially aviation assets, but for all their worth there should always be a back-up plan. Success or failure should never hinge on use of aviation assets. This is true because attack helicopters and fixed-wing aircraft are restricted by adverse weather and winds. Although they can dominant by fire, they cannot seize or hold terrain nor do they possess the capability to survive direct or indirect fires. Fehrenbach describes it best in his book, This Kind of War.

You may fly over a land forever; you may bomb it, atomize it, pulverize it and wipe it clean of life, but if you desire to defend it, protect it, and keep it for civilization, you must do this on the ground, the way the Roman legions did, by putting young men into the mud.³⁵

In these days of technological advances, the tank possesses the most balance when weighing all the capabilities in terms of lethality, mobility, survivability and the ability to sustain continuous combat operations. The tank is also the most advanced technological ground weapons system in the United States arsenal. This is why we need the main battle tank.

Armor has four basic missions on the battlefield; offensive operations, support of infantry, reconnaissance and security. Offensive operations are the characteristic mission using speed, firepower, and shock effect to attack and exploit enemy vulnerabilities. Mobility makes possible the achievement of surprise. Armored and mechanized forces possess the ability to attack deep into the enemy rear or conduct wide envelopments.

They maneuver to seize terrain, destroy command, control and communications centers, missile sites, artillery, reserve concentrations and logistics centers. Even in the defense, armor retains offensive characteristics permitting rapid reinforcement or counterattack. An excellent example can be found during the Second World War of how Germany continued to use the offensive capabilities of their tanks even in the face of defeat.

When the tide of war turned against Germany and opportunities for large scale offensive operations vanished the principal role of the panzer divisions became that of delivering swift and powerful counter-blows against hostile penetration. As the general situation deteriorated, panzer divisions became the backbone of the German defence as much as they had been the spearhead of the earlier offensives. They took to defending critical sectors, holding key points with their infantry and counterattacking with their tanks, and to delaying defence in small mobile battlegroups.³⁶

Support of infantry, the original mission of armor is still vitally essential. Tanks increase greatly the firepower and mobility of the infantry attack or defense and provide a powerful armor defeating capability.³⁷ Armor employed with dismounted infantry in close terrain or an urban environment enhances infantry capability to destroy dug in enemy positions and strong points.

Reconnaissance and security missions are usually conducted for the higher organization or commander by cavalry units using ground and air means. These missions require highly mobile forces with ground combat capability. As the range of weapons are extended, the battlefield becomes less densely

populated, and as units are more widely dispersed the requirements for reconnaissance and security becomes more acute.³⁸ Tactical intelligence or information gathering for the higher commander is the single most important aspect on the battlefield. Human sources gain and maintain contact with the enemy reporting his size, location and movement. Reconnaissance usually requires rapid movement over large areas and always requires the use of stealth, usually dismounting for detailed observation or examination. Security requires protecting friendly forces from surprise or attack. Using observation, surveillance and dismounted patrolling, scouts will detect and report any approaching enemy forces. If required they will develop the situation and destroy those enemy forces within their capabilities.

Armored forces are comprised of more than just the main battle tank and are organized into four different types of organizations or units. 1. Tank battalions are built around the main battle tank and are organic to maneuver brigades of mechanized or armored divisions. They usually fight in task organized (cross attached) tank or mechanized infantry task forces with the primary mission to close with and destroy the enemy using fire and maneuver.³⁹ 2. Light armor, there is only one light armor battalion in the entire army, it is organic to the 82nd Airborne Division and equipped with the M551A1 Sheridan. This vehicle is designed to be transported by strategic airlift and to provide mobility and long range direct fires in support of light infantry. 3. Cavalry

organizations provide reconnaissance, security, economy of force and perform battle handover missions for the next higher organization.⁴⁰ They are organized into regiments at the corps level and squadrons at the division level. Current doctrine calls for one regiment per corps and one squadron per division. Based on current doctrine (AirLand Battle) the army does not have enough active component cavalry regiments for each corps. Neither I Corps or XVIII Airborne Corps have organic cavalry regiments. Serious consideration is being given to activating a Light Cavalry Regiment (LCR) for the XVIII Airborne Corps. Future doctrine (AirLand Battle-Future) indicates a possible need for two regiments per corps. Cavalry units use a variety of complementary vehicles and weapons systems to accomplish their missions; tanks, cavalry fighting vehicles, scout and attack helicopters. Those cavalry squadrons organic to light infantry divisions use wheeled vehicles (HMMWV) and/or scout and attack helicopters to conduct their operations.

4. The scout platoon is the smallest armor unit and is organic to infantry and tank battalions in mechanized infantry and armor divisions. They are mounted in cavalry fighting vehicles or wheeled vehicles (HMMWV) and perform reconnaissance, security and surveillance for their battalion. Future doctrine indicates a need for a scout platoon at the brigade level.⁴¹

The organization of armored forces as part of the combined arms are versatile, can be task organized or tailored in accordance with the mission or other factors of METT-T. The armor forces of the future will facilitate the transition

toward a more global deployable army and the projecting of land combat power. Armor will be part of forward presence, contingency and reinforcing forces. Deployability will play a large part in determining the armor weapons systems of the future.

Material: Mount Up! On Which Horse?

As part of the contingency forces armor elements must be rapidly deployable by Air Force and Navy or Maritime assets to meet the wide range of future threats that may face the U.S. in any region of the world. In a global context, the idea is to rapidly deploy a force that can provide the shock effect to take the initiative, control the crisis, influence decisions, stop a conflict or gain time for negotiations or military build-up.⁴² That implies an initial entry force with the combat power for immediate impact on the situation. An organization with main battle tanks possesses that impact, but would be restricted to sealift arriving later in the operation. An armored or mechanized division deployed as part of the contingency force would require approximately 30 days to arrive in a given theater of operations due to the neccessity of transportation of equipment by sealift assets. This assumes there is no pre-positioned equipment available in that region.

There is not very much to fill that void in the interim by using strategic airlift except HMMWV's mounting machine

guns or TOW missiles or a limited number of M551A1 Sheridans. At the present time there is only one light armor battalion that can be immediately deployed into a low to mid intensity conflict with little prior notice. This is the only unit which is capable of arriving with assault troops and providing the support necessary to counter enemy armor or larger infantry forces. The combined arms force being the key to success, this demonstrates the necessity to provide an armor complement during the initial stage of conflict.⁴³ The Sheridan vehicle was phased out of the inventory in the late seventies except in the airborne division. During the same time frame, replacement vehicles and gun systems were in developmental testing, but never procured. That has come back to haunt the Army. The most single glaring deficiency in the armor community is the lack of an air deployable light armor vehicle possessing a high velocity direct fire weapons system. There is a long overdue need for light armor, strategically mobile by airlift, prepared to deploy and fight with light infantry forces or initial entry contingency forces.

In order to meet initial rapid deployment criteria it is recognized, based on current technologies, that the light armored vehicle may not be as lethal as the main battle tank. Certainly, a light armored vehicle will not be as survivable as a main battle tank, but would provide protection against shrapnel, small arms and some larger caliber weapons.

Technology also drives the future main battle tank. The most likely candidate for increased lethality in the future

is a larger smooth bore main gun of approximately 140mm. There are other systems in the distant future, the laser range finder may become a laser gun or there may be a future directed energy system. Directed energy weapon technology uses lasers, microwaves or particle beams to achieve target effect through electromagnetic radiation or subatomic particles. Potential application for directed energy weapons onto almost every combat vehicle exists. Some directed energy weapons may be fielded by 1995.⁴⁴ The Army is attempting to develop promising electromagnetic/electrothermal gun technologies in lieu of the conventional gun. However, those technologies would likely not be available until 2004.⁴⁵ The next tank will mount a conventional type weapon as the main gun, but lethality will benefit from improvements in target acquisition and fire control, as well as a larger gun.

The way to improve mobility is to design a vehicle that has the ability to move across the ground and fly when necessary to bypass obstacles or fly and be able to move on the ground when necessary. The later part of the twenty first century may see some sort of "anti-gravity or inner space vehicle" capable of doing that. If it were self deployable to anywhere on the globe that would solve an enormous strategic lift equation. However, technology has not progressed to that point. Mobility aspects will continue to orient on power to weight ratios, suspension systems and track design. Engineers will strive for improved cross country speed and maneuverability by improving or attempting to revolutionize those aspects

above. Emphasis will be placed on improving agility in negotiating vertical and horizontal obstacles. Mobility will be increased through total weight reduction.

Survivability can be a function of vehicle profile, lethality and mobility, but armor ballistic protection is considered the major ingredient. Technology has produced dramatic improvements in the protection offered by armor. There are a number of types of armor; spaced, laminated, ceramic, composite, specialized, modular, reactive and applique, usually designed or added on to defeat a particular type of ammunition. Research will continue to improve the protective qualities of armor and at the same time reduce the weight. The future tank will have modular armor to meet ballistic protection required and enable upgrade without design changes.⁴⁶ In the near future technology will not produce an alternative to armor ballistic protection. During the next century it is highly possible that some sort of anti-matter fields or energy shields could be developed which would eliminate the requirements for armor ballistic protection. Such a protective device or system would be able to maintain survivability without the weight of armor.

There will be improvements to combat sustainability with the addition of some new technological advances. An improved CO₂ laser range finder will have an enhanced ability to penetrate fog and other adverse battlefield conditions. A thermal viewer for the driver will improve his vision during night operations and in bad weather. Navigation will be easier with a position

navigation (POS/NAV) system that displays ground location and heading information to the driver and tank commander. This POS/NAV system will make movement and battlefield coordination easier especially at night and in all types of weather.⁴⁷

Main battle tank design and performance should be based on the total system performance of lethality, mobility, survivability and sustainability. The optimum tank design will encompass the area where each of these overlay the other. The future main battle tank will be designed in that context based on today's technology. But there are other areas which must also be considered when designing the optimum weapons system; the threat, doctrine, force structure and deployability. If one weapons system can fulfill all the variables, then one type of system is all that would be required. However, one weapons system can not be designed to fulfill all of these variables with today's technology because some performance measures are mutually exclusive. A system that is lethal and survivable means that it is not air transportable. Either the main battle tank or a light armor vehicle can support infantry. The light armor system is air transportable, but not as lethal and does not even compare to the survivability of the main battle tank. In the reconnaissance role the requirements dictate a need for a versatile vehicle; small agile, mobile. The scout relies on the principle of "see, but not be seen," stealth, dismounted patrolling and indirect fires to accomplish his mission. The main battle tank can

do part of that, but not all of it and it has a different mission, to kill the enemy after the scouts have found the enemy.

The far sighted individual feels that a significant portion of the Army should consist of troops that are organized, trained and equipped to fight mounted whenever the situation permits. Someday that soldier might fight mounted in the form of a space vehicle, but certainly for the significant future armor is going to require three separate vehicle/weapons systems. Two or three generations into the future, technology might permit a single weapons system that will be completely different from what we now have. Leadership will have to recognize that and look to the future ensuring that the new technology is grasped and the old "mounts" are retired.

Three major systems will be required by the future armor force, the main battle tank, a light armored vehicle and a scout vehicle. The future main battle tank, known as the Block III tank will probably enter production about 2001.⁴⁸ It will be two years beyond that before the first unit is equipped with the Block III tank. Technological improvements will be tremendous. The tank will have an advanced tank cannon system of about 140mm with an automatic loader. A directed energy system will probably be incorporated into secondary armament. The tank commander will have an independent thermal viewer and multi-sensor, panoramic target acquisition system. Survival measures will include advanced modular armor and an electronic countermeasure/signature reduction package.

The new tank will weight approximately 55 tons with an improved track and suspension system contributing to mobility. Communications systems will be better with data bus electronics and vetronics (vehicle electronics) capable of voice and digital burst transmissions. Even new technology is not without uncertainties. The larger main gun may have undesirable effects from gun tube blast over pressure on near-by ground troops. There may also be a problem with clearing residual toxic fumes from inside the turret. Such a large caliber gun will create ammunition capacity and storage problems which must be overcome.⁴⁹ The automatic loader will mean the loss of at least one crewmen which may effect combat sustainability and increase the workload for remaining crewmen.

The light armored vehicle will be known as an armored gun system. This will provide support for dismounted infantry, destroy point targets and defeat threat armor encountered during contingency operations. This system will mount a 105mm main gun and provide protection against small arms and artillery fire. It will be readily deployable for use in low and mid intensity conflicts. It will most likely be a tracked vehicle, but that is not certain, weight will be somewhere between 15 to 18 tons and some may be air dropable. Fielding should begin between 1994 to 1998. The armored gun system will add a dimension to the combined arms capability of light forces.⁵⁰

The future scout vehicle (FSV) will be employed in cavalry and scout units of both light and heavy forces. Moving forward of friendly elements it will rely on electronic countermeasure

systems and signature reduction technologies to remain undetected and enhance survivability. It will have multi-sensors for surveillance and target tracking. The FSV will be equipped with POS/NAV, identification-friend or foe (IFF) and state of the art vetronics for for communication. A directed energy weapons system will probably be a self defense measure.⁵¹ As new technologies are applied the challenge will be to train soldiers and leaders to use them to the full advantage.

Continuing Mission: What is ahead?

This will be a decade of declining budgets with severely competing priorities. There will be a reduction in force, the end strength of the Army will drop drastically to between 480,000 to 535,000 prior to the turn of the century. Such end strength will not support the forecast of twelve divisions. Soldiers in the ranks know battalions can not get smaller. The hope is that senior leaders take down major flags rather than hollowing out battalions through a further reduction of individual specialties or by eliminating one company as suggested by ALB-F. The number of maneuver units will come down, but that reduction must be balanced and proportional. History clearly points out the requirements for the separate arms to fight together in order to ensure success. A great number of failures in this century hinge on improper application of combined arms.⁵²

Forward defense will shift to forward presence both

in Europe and the Far East with a possibility of no U.S. forces in Europe or Korea by the turn of the century. This forward presence will require in turn a world wide focus with emphasis on deployability in order to meet contingency requirements. Contingency forces will require an expansion of light armor forces, but at the same time the contingency forces will require a balance of heavy forces. Conflict can be anywhere across the across the spectrum, but with the most likely conflicts falling from mid to low intensity. Light Forces alone, in a twenty first century mid intensity scenario, will be insufficient to produce winning results. Heavy and light forces working in concert appear to be the direction in which the Army is moving as we approach the twenty first century.⁵³

Focusing on tank - infantry cooperation, it is apparent that infantry needs the firepower and mobility that armor can provide. On the other hand, tanks require infantry support for their protection. The necessary proportional mix of tanks and infantry and other supporting arms and services vary with the factors of METT-T. Certain considerations require tank heavy forces while other conditions require infantry dominated forces. In the final analysis, commanders of combined arms forces must have all of the types of forces necessary to quickly react to the changing situation.⁵⁴ Armor can fight across the spectrum of conflict even in the lowest intensity of conflict in a third world country, if the infantry needs that support. Armor will be an absolute necessity in mid to high intensity conflicts. Comprising approximately four per cent of the

total Army personnel strength, armor also comprises 40 per cent of the ground maneuver battalions. When the Army reduces forces it must be a proportional draw down. The Army will require a balanced force structure in the future composed of heavy and light forces. The combined arms team has to be retained in tact at the reduced manning level.

Armor was instituted as a basic branch in 1950, with the integration and continuation of cavalry. The combat arm of decision is characterized by speed, firepower, and shock effect. More than just words, armor forces provide the capability for violent execution of the offense. Well into the twenty first century armor forces will provide the only continuous offensive weapons capability for the Army. Future armor forces will be organized into a balanced mix for heavy or light contingencies. Armor will continue to be an integral part of the combined arms forces prepared to deploy and fight on any battlefield anywhere in the world and win.⁵⁵

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