

**Light Infantry, Augmentation, and the
M113A3 Armored Personnel Carrier:
A Step in the Direction of Versatility**

**A Monograph
by
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Infantry**



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ABSTRACT

LIGHT INFANTRY, AUGMENTATION, AND THE M113A3 ARMORED PERSONNEL CARRIER: A STEP IN THE DIRECTION OF VERSATILITY
by MAJ William K. Sutey, USA, 63 pages.

This paper examines a proposal to create M113 Armored Personnel Carrier support units (vehicles, drivers, and service support) to provide protected tactical mobility augmentation for light infantry forces. Light infantry divisions are a crucial component of the Army's force structure to meet potential challenges across the spectrum of conflict. They lack, however, the tactical mobility assets to be of any utility beyond the lowest intensity conflicts in the most restrictive terrain. This limitation constrains the Army's versatility as a whole.

This monograph first considers tactical mobility as an element of combat power, establishes an analytical framework for the analysis of the infantry mobility systems, and considers the heavily armed and mobile nature of potential world threats. Next, the light infantry concept is explored focusing on the intended purposes for which light infantry divisions were formed and an evaluation of their actual tactical mobility capabilities. Following this examination of today's light infantry, this paper looks at the Pentomic Era in the late 1950's in which M59 armored personnel carrier companies were consolidated at division level and sent vehicles as attachments to augment the tactical mobility of infantry units.

Finally, this monograph conceptually outlines a proposal to use M113 APC's to augment deployed light forces and evaluates how this might enhance their utility. Although there are philosophical objections to, and practical problems with, augmenting light infantry with armored personnel carriers, this paper concludes that today's demands for maximizing the versatility of all forces merits reexamination of such a concept.

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I. Introduction

The debate over the utility of United States Army Light Infantry Divisions (LID) as a strategic, operational, or tactical force continues despite their nearly ten years of existence and employment. Proponents argue that the absolute flexibility of light infantry forces have utility across the spectrum of conflict, from low-intensity guerrilla type wars in jungles or mountains to high-intensity wars involving mechanized forces. Critics argue that light infantry, as now organized and equipped, cannot fight effectively at any level of war.¹

Where this continuing debate will lead depends upon the political and economic environment in which it is waged. The Light Infantry Division concept was born of an analysis in the late 1970's and early 1980's which forecast a decreasing likelihood of general war against the Soviet Union and an increasing likelihood of contingency, low-intensity conflicts against third world nations, guerrillas or terrorists.² Army leaders asserted that the contemporary force structure was too heavy for rapid strategic deployment or use in contingency operations and rushed to justify, develop, and field the 10,000 man light infantry division.³ Strategic deployability was critical to the light divisions creation, fighting capability was secondary. In order to overcome fiscal constraints, the Army extracted two additional light divisions from existing end-strength at the expense of heavy divisions.⁴

The strategic, political and economic, environment for force development today is even more unsettled and constraining than it was ten years ago.⁵ The dissolution of the Soviet Union has further reduced the probability of general war, but, as the events in Southwest Asia

demonstrate conventional type wars are still possible. Even before the war with Iraq, budgetary constraints were driving the US armed forces to reassess and re-justify force structure and technology. The US Army needs a range of capability for lower and higher intensity conflicts. Given the lessons of Panama and Southwest Asia, justification for the Army's current mix of heavy and light forces is reasonable. These conflicts also point to two very specific organizational and technological challenges. The Army must find the means to enhance the strategic mobility of heavy forces to reinforce contingency units, and enhance the tactical mobility and firepower of light forces to give them the ability to survive until reinforced.⁶ Both present significant structural and doctrinal challenges. Military theorist Michael Howard asserts that:

..whatever doctrine the Armed Forces are working on now, they have got it wrong...[but]...it does not matter that they have got it wrong. What does matter is their capacity to get it right quickly when the moment arrives...It is this flexibility both in the minds of the armed forces and in their organization, that needs above all to be developed in peacetime.⁷

Arguably, US Army light infantry employment doctrine fails this simple test; we are too far wrong and deny ourselves the capacity for rapid adjustment. Organizational flexibility is crucial to military success, or reducing the risk of failure.⁸ Military organizations that are adaptable and versatile are better prepared for any contingency. Therefore, devising the means to enhance the light force's tactical mobility provides an important contribution to its military utility. Light infantry divisions have a role to play in modern warfare, even if that role is limited.⁹ The Army must find ways to assure their relevance across the spectrum of conflict.

During the conceptualization of the light infantry division, the Army recognized that such a force would require combat, combat support, and combat service support augmentation to enhance light infantry's inherent sustainability, firepower, and tactical mobility weaknesses.¹⁰ The light infantry division's lack of tactical mobility, once deployed, is its greatest weakness¹¹ and presents the greatest challenges to their employment across the spectrum of conflict. Light forces could be augmented with more high mobility, multi-purpose wheeled vehicles, more trucks, or more utility helicopters, but this would require taking those assets from other units. Depending upon the situation—especially against a lightly armed enemy in close terrain—this type of augmentation may be appropriate. However, under mid-intensity conditions in more open terrain light forces would be better supported by the protected mobility of armored personnel carriers (APC's). The Army's modernization of forces to the M2 Bradley Fighting Vehicle has left hundreds of M113 armored personnel carriers available for use outside the heavy divisions. Providing for the tactical mobility of light divisions through augmentation with M113 armored personnel carriers may give light forces greater utility at higher levels of conflict outside the most narrow of light infantry missions.

This paper examines a proposal to create M113 APC equipment and supported units available to provide protected mobility augmentation for light infantry forces. Section II of this paper considers tactical mobility as an element of combat power and establishes an analytical framework. Section III explores the light infantry concept focusing on the intended purposes for which light infantry divisions were formed and an evaluation of their actual tactical mobility capabilities. Section IV examines the case of the Pentomic division in the late 1950's in which M59 APC's were

consolidated at division level and distributed as augmentation for maneuver units. Section V conceptually outlines a proposal to use M113 APC's to augment deployed light forces and evaluates how this might enhance their utility.

II. Mobility

This section seeks to understand tactical mobility and identifies those qualities (criteria) of mobility necessary for an analysis of light infantry. Initially, this section defines "mobility" and draws the distinctions necessary to isolate tactical mobility for study. Once defined, this section isolates the qualities of tactical mobility for use as a framework in the analysis of current light infantry capabilities, the Pentomic division's use of the M59 APC, and a proposal to use M113 APC's as mobility augmentation.

Military usage in the Oxford Dictionary simply defines mobility as "the quality of being able to move rapidly from one position to another."¹² As one considers those "qualities" associated with being able to move rapidly, the meaning of mobility becomes very complex. Merely moving rapidly is not enough for mobility to be a militarily useful concept. A 1960 Command and General Staff College study of mobility offered this clearly specific and much more useful definition:

Military mobility is the capability to make controlled movement of combat power to the place and at the time required to accomplish the assigned mission without unacceptable loss or logistical effort. Military mobility of a force must be measured against the enemy's capabilities.¹³

More recently, the Joint Chiefs of Staff Dictionary of Military and Associated Terms defined mobility as, "a quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill the primary mission."¹⁴ This JCS definition is broadly drawn to reflect a wider range of capabilities and missions, other than direct combat, suitable for all types of forces in all services. The JCS

recognize there are different kinds of mobility, but leave out its relationship to the mobility of the enemy.

Trevor Dupuy, et al, identify the differences in types of mobility in their definition:

Mobility [is] the ability of military units, items of equipment to move as units from place to place, including the ability to support them logistically during and after movement. Strategic mobility is the capability of large military units for movement in or between theaters of operation. Tactical mobility is the capability of any military unit for movement or maneuver on the battlefield or in the face of the enemy.¹⁵

Tactical mobility [is] the capability of a unit, command, task force, or the like to be readily moved in support of combat or moved while engaged in combat. For instance, airplanes, tanks, motorized infantry, and naval destroyers have tactical mobility.¹⁶

Mobility, even in Dupuy's definition, remains essentially a capacity for movement of combat power (personnel and equipment), but suggests that different types of mobility have different types of requirements. In this definition an organization's tactical mobility (readily moved about in combat or usefulness on the battlefield) is a function of the technological means available. However, Dupuy's definition does not consider mobility in relation to an enemy's capability.

Edward Luttwak and Stuart Koehl, noted military theorists and consultants, offer a simple definition of mobility, then identify different types of mobility. Mobility, they assert, is "the ability of troops and equipment to move or be moved from one place to another."¹⁷ This ability, they argue, differs at the strategic, operational, and tactical levels of war. Mobility at each level has requirements which are incompatible at the other levels. In other words, the properties of a force that make it strategically mobile, limit its operational or tactical mobility.

Strategic mobility is the ability to move troops and equipment from home to distant theaters, or from one theater to another.¹⁸ Strategic mobility usually uses air transportation to achieve speed which limits troop, equipment, and supply weights at the expense of tactical mobility, firepower, sustainability, and protection. By this definition, airborne forces are strategically mobile, but lack significant capabilities in local mobility, firepower, sustainability, and protection. Armored forces are much less strategically mobile requiring several times longer to deploy by air or sea, depending upon distances and dedication of lift assets.

Operational mobility is the ability to quickly move troops, equipment, and supplies (not in contact with an enemy) over relatively long distances within a theater.¹⁹ This requires the speed and endurance of air and wheeled vehicles. Helicopters or motorized units are operationally mobile, but also lack the protection that Luttwak and Koehl believe is required for tactical mobility.

"Tactical mobility," according to Luttwak and Koehl, "is the ability to move on the battlefield, in the face of enemy fire."²⁰ The key attributes of tactical mobility are firepower and protection from the affects of enemy fire afforded by heavy armor. "Speed", they argue, "is almost irrelevant."²¹ The technological trade-offs on firepower and protection to achieve speed renders such a system less tactically mobile. Tactically mobile forces, such as armored, mechanized, motorized, or heliborne, are usually too heavy for rapid strategic transportation by air and do not have the speed or endurance on their own for useful operational mobility.

The incompatibilities between strategic, operational, and tactical mobility are challenging but not insurmountable. Technological advances will always operate to increase the capability of strategic means of

mobility to carry larger numbers and types of tactically mobile forces and equipment. Technological efforts also work to make the means of tactical mobility lighter and smaller, while minimizing trade-offs of protection and firepower, to increase their strategic deployability. This is the greatest technological challenge facing our conventional forces today: increasing strategic mobility without giving up tactical mobility, or, increasing tactical mobility within the constraints of our current strategic mobility capabilities. US light infantry forces represent the Army's efforts in the latter case since they are designed for greater strategic deployability than possible with regular or mechanized forces. Given our current national military strategy's orientation on force projection and rapid deployability, our strategic mobility requirements, both in terms of the means of deployment and the means to be deployed, are beyond our technological and fiscal capabilities.²²

Tactical mobility for the purpose of this study is best served by Dupuy's definition: the ability to move on the battlefield, relative to an enemy's ability, in support of combat or while engaged in combat. Light infantry, moving on foot in difficult terrain, is tactically mobile under this broad definition. However, the Army implicitly accepts the risk early in a mid- to high-intensity crisis that light infantry's tactical mobility requirements, relative to enemy and terrain, can be satisfied by their organic means. As a theater matures with heavier forces, the utility of light forces decreases as the mobility, and therefore the speed of operations of the rest of the force increases. The challenge is to provide the theater commander a means to increase the tactical mobility and versatility of light infantry at the middle to higher levels of war in less

restrictive terrain. The M113 APC augmentation to light infantry forces may provide such a means.

Tactical mobility is more than merely moving. It is a critical component of a complex system of related qualities and conditions which in action produce effects on the battlefield. The following discussion examines this interactive system and isolates criteria relevant to the analysis of tactical mobility.

Mobility essentially remains the capacity for movement, but movement lies at the heart of strategy and tactics. Commanders maneuver their forces, "on the battlefield through movement and direct fires in combination with fire support, or fire potential, to achieve a position of advantage in respect to the enemy ground forces in order to accomplish the mission."²³ Movement is a critical function of maneuver and requires units capable of placing and keeping forces in a position of advantage, maximizing the benefits of terrain or formation, relative to an enemy force. Assessing a force's mobility one must consider its requirements and capabilities to move on the ground. The ability to move personnel and their equipment quickly in combat contributes to the determination of who will win in battle. According to Huba Wass de Czege, a general officer and author of the Army's AirLand Battle Doctrine, "any property of combat action that influences the outcome of battle," is a measure of combat power.²⁴ Mobility as a property of combat action, therefore, is a measure of combat power.

General Wass de Czege provides the analyst a framework for judging a force's combat power.²⁵ Good military judgment, he argues, *must understand and consider the essential variables, or functions, usually related to success in war.* Central to this approach is the

"interrelatedness of the functions performed during the preparation for and conduct of war."²⁶ Like any theoretical framework, General Wass de Czege's model abstracts a complex, interactive system of combat functions and capabilities. The model provides a coherent frame of reference for isolating specific functions for closer inspection and analysis for a variety of purposes including force design, fighting concepts, and doctrine.

The essence of combat power is never absolute. Mobility is only useful when considered in relation to an enemy in the time and place where battles are decided.²⁷

Prior to battle there exists only capability. Leaders and the forces of their environment, to include the actions of the enemy, transform this capability into combat power...The appropriate combination of maneuver, firepower, and protection by a skillful leader within a sound operational plan will turn combat potential into actual combat power. Superior combat power applied at the decisive place and time decides the battle.²⁸

Maneuver, firepower, protection and leadership provide the essential, dynamic variables of combat power. The effective application of each, in relation to each other and against the application of the enemy's combat potential, determines the outcome of engagements.

Maneuver seeks to concentrate combat capabilities to take advantage of "surprise, psychological shock, position, and momentum...and thereby create a decisive relative advantage" over an enemy.²⁹ The effects on an enemy created by maneuver--disorientation, disorganization, or disintegration--are maneuver's contribution to combat power. Mobility is a sub-element of maneuver, however, "mobility or movement in and of themselves do not create this [maneuver] effect

although relative mobility or relative movement are enabling capabilities."³⁰ Mobility superior to that of an enemy enables a force to impose an effect on an enemy, and thus provides a unit with a critical advantage in potential combat power. The application of this superiority at the right time and place as an element of maneuver can be decisive in combat:

Effective tactical maneuver consists of the ability to engage the enemy or avoid being engaged in such a way as to maximize the effects of friendly firepower and minimize the effects of enemy firepower...It is thus a function of unit mobility, effective tactical analysis, effective management of resources, and effective command, control, and communication.³¹

Unit mobility as an element of the maneuver effect in General Wass de Czege's combat power model is a function of the physical fitness of soldiers, teamwork and esprit, equipment capabilities and maintenance, and mobility skills (experience and training) with a variety of purposes for and means of movement.³² The importance of physical fitness and teamwork to unit mobility are apparent, especially to infantry forces. Useful to this analysis, however, are the elements related to equipment, and mobility skills.

A unit's mobility capability is clearly a function of the design characteristics and quantity of equipment available to move the force, and the terrain and weather's impact upon that equipment.³³ Equipment availability is influenced by the unit's maintenance and sustainment system; equipment is available to the extent that maintenance failures are reduced and the flow of consumable supplies remains uninterrupted.

Mobility skills are of "paramount importance on the modern battlefield."³⁴ A unit's ability to move, evident in road marching (mounted

or dismounted), map reading, occupation of assembly areas, use of terrain to cover and conceal movement, overcoming both natural and man-made obstacles, and many other tasks, reflect upon the quality of mobility skills.

A framework for analyzing the adequacy of a force's mobility is based, in large part, upon the unit's equipment type, availability, and mobility skills. Design characteristics determine equipment types appropriate to the terrain. For example, wheeled vehicles are most appropriate for road networks and track laying vehicles, such as the M113 APC, for cross country movement. Availability is measured in terms of how much of the force can be moved at the same time and what systems are in place to maintain and sustain the equipment. A truly mobile force can move all its combat power at the same time and provide continuous fuel, recovery, and maintenance for equipment to keep it in service. A force that cannot move 100% of its combat power nor maintain or sustain its equipment over time will operate at an increasing disadvantage as its relative mobility continuously declines. Mobility skills are a function of the frequency of training a unit receives with the equipment—more training obviously increasing skills. These elements of General Wass de Czege's model provide a framework for the analysis of current light infantry tactical mobility, a historical case in which infantry was occasionally augmented with M59 APC's, and a proposal to augment current light infantry with M113 APC's..

The foundation of our understanding of mobility then is the complex interaction of all the factors on the battlefield that influence our ability to move combat power in relation to the enemy's capabilities. Maneuver is how we choose to move our combat power to gain the

advantage, relative to the enemy's position or movement choices, and achieve decisive effects. Mobility is a critical dynamic of maneuver. Without equal or greater mobility relative to an enemy, a force suffers a significant disadvantage not easily offset by firepower or protection. The following discussion examines the nature of the threat that light infantry forces are likely to face.

According to the US Army Combined Arms Command's Foreign Military Studies Office, the end of the Cold War has fundamentally changed our security environment, "from a single, unified threat to multiple dangers, i.e., from a threat that was coherent in its imminence, centrality, and high intensity to multi-dangers that are less imminent, more defuse, and more low- to mid-range in intensity."³⁵ Chief among these "dangers" is the disintegration of the Soviet empire and the resultant, "political, economic, and nationalistic crises, which are driving people to despair and desperation."³⁶ This period of disintegration has reduced East-West tensions, but has also left a "security vacuum."³⁷ Global security threats are characterized by the redistribution of economic power relationships, ethnic and religious forces upsetting established political orders, and technology making it possible for smaller nations to compete militarily and economically on a local basis with traditional world powers.³⁸

Our least likely future conflicts are general, high-intensity war as feared in Europe through the Cold War, or low-intensity, counter-insurgency as experienced in Viet Nam. Mid-intensity conflicts such as occurred in Iraq, or could occur in Korea, Eastern Europe, or Eurasia, are more likely. The Foreign Military Studies Office focuses its analysis on the particularly volatile breakup of the former Soviet Union.³⁹ All former

Soviet republics are subject to ethnic, religious, nationalistic, or civil warfare resistant to peaceful resolution, internally or externally. As reported by the Center for Strategic and International Studies (CSIS) in 1990:

The opponent in future conventional combat is probably going to be as well armed as US forces. That US troops are better armed than any they are likely to oppose is a popular misconception. But with the proliferation of sophisticated weapons in the Third World just about any fight that US forces get into, at least initially, will be against forces that are at least as well armed⁴⁰...

With the decline of the Soviet military threat to Europe, conflict that might be termed 'mid-intensity' conflict will dominate US planning concerns. The potential for US involvement in mid-intensity conflict--war with or between powerful regional states--will provide a key justification for military budgets during the 1990's and will establish most of the threats against which US forces are sized, trained, and equipped.⁴¹

The Army has apprehensively acknowledged the increasingly sophisticated combat capabilities of developing nations around the world. Chief of Staff of the Army, General Carl Vuono, noted in 1988 that twelve Third World nations each had over one thousand main battle tanks.⁴² Mechanization at this level cannot be overcome without adequate mobility.

Operations Desert Shield and Desert Storm confirmed many analyst's expectations about modern mid- to high-intensity warfare.⁴³ Modern warfare is, "fast-moving, mechanized combat fought by mobile armies over thousands of square miles," and that it requires, "tactically mobile, hard hitting, well protected combat units."⁴⁴ American participation in foreign operations, without the advantage of forward deployed forces, will require contingency units capable of meeting and

defeating relatively more lethal and mobile threats.⁴⁵ The role of light infantry, given its lack of tactical mobility or protection, will be limited.

The challenge is to build versatility into the employment of light infantry to maximize their potential contribution to the Army's effort across the spectrum of conflict. Versatility, as a tenant of operations in the proposed changes to the Army's keystone doctrine manual (FM 100-5, Operations), requires multi-functional forces capable of rapid and efficient shifts of focus or organization necessary to perform at tactical or operational levels.⁴⁶ Light infantry has limited versatility and, therefore, limited utility given the range of threats all army forces must be able to confront.

III. The Light Infantry Concept: Purpose and Mobility Capabilities

The number of reports, articles, and papers which address the concept of light infantry indicates the degree of controversy over their organization and employment.⁴⁷ Rather than a careful objective analysis of operational realities, as the Army's force design system ordinarily requires, the process by which the Army developed its current light infantry force reflects political and bureaucratic realities, and the personal preferences of senior leaders.⁴⁸ This section outlines the intent of Army leadership during the conceptualization and design of light infantry divisions, and then evaluates their purpose to determine if augmentation with M113 APC's is a relevant concept

Army force structure and modernization during the 1970's oriented on heavy forces, armored and mechanized, based upon the perceived threat to NATO posed by a massive armored Warsaw Pact military. Light infantry development received little emphasis due to the improbable commitment of armed force anywhere in the world other than NATO.⁴⁹ In 1979, Chief of Staff General Edward Meyer stopped the process of mechanization and directed that instead of merely armoring the remaining infantry divisions, Army planners study the utility of emerging anti-armor firepower and mobility technologies in order to create a rapidly deployable, flexible contingency force. The new type force would serve two purposes: rapid deployability to reinforce NATO and worldwide contingency operations. To satisfy these purposes required a new lighter infantry division emphasizing the latest technology, strong anti-armor capability, versatility, tactical mobility, sustainability, survivability, and strategic deployability.⁵⁰

General Meyer envisioned the self-sufficient, technology intensive light division as reinforcing NATO first, but recognized the challenge of lower intensity, non-European contingency operations such as Southwest Asia.⁵¹ During the Soviet invasion of Afghanistan (1979-1980), President Carter's administration and the Army realized the military limitations posed by the lack of our strategic deployability.⁵² Power projection became an emphasis of national strategic policy. In this political and bureaucratic climate, the Army suffered a declining share of the defense budget. Shifting to lighter, more rapidly deployable forces might enhance the strategic relevance of the Army and improve its budgetary prospects.⁵³

General Meyer's vision of a light division (in reality a middleweight motorized division) was overtaken by political and bureaucratic realities in 1983 under the next Chief of Staff, General John Wickham. General Wickham's view of world security issues mirrored that of General Meyer:

Army leadership is convinced, based upon careful examination of studies which postulate the kind of world in which we will be living and the nature of conflict we can expect to face, that an important need exists for highly trained, rapidly deployable light forces. The British action in the Falkland Islands, Israeli operations in Lebanon, and our recent experience in Grenada confirm that credible forces do not always have to be heavy.⁵⁴

General Wickham's concept of light infantry continued to satisfy the need to pursue budgetary dollars in the roles and missions competition over strategic deployability, power projection, and low-intensity conflict.⁵⁵ He recognized the incapability of strategic airlift and sealift to deploy the army quickly and, therefore, sought to lighten the army to fit the lift available. Budgetary constraints also drove how the

army intended to use the money it did receive. Modernization of heavy forces was extremely expensive; comparatively inexpensive light divisions allowed the army to increase its structure to eighteen active and ten reserved divisions.

Contrary to General Meyer's concept, General Wickham envisioned employing light infantry primarily as low-intensity contingency forces, and secondarily as reinforcements to NATO. Southwest Asia was de-emphasized as an area of concern for potential conflict. Given this geo-strategic perspective, "lighter forces could be justified without a Southwest Asia mission, the divisions would under almost no circumstances have to face enemy heavy forces in open terrain."⁵⁶

In August, 1983, General Wickham directed the Training and Doctrine Command (TRADOC) to develop a light infantry division concept by an exceptionally accelerated force design process. His guidance to TRADOC specifically limited the required design to: about 10,000 soldiers, nine maneuver battalions, deployable in 400 to 500 aircraft sorties, and with infantry equal to at least one-half the division.⁵⁷ More guidance and clarification evolved over the course of the concept's rapid development.⁵⁸

Initial guidance from TRADOC sought to inspire innovative thinking necessary to minimize personnel and equipment to improve deployability. Designers were told to include only personnel or equipment necessary to operations under all conditions and situations. Complementary or supplementary capabilities only needed occasionally would be provided by rapid augmentation or pooled at division for distribution as required. Light infantry designers must reduce the number of non-tactical soldiers and equipment, unnecessary command and control or logistics

administrative linkages, and support requirements for both personnel and equipment. The light division was not required to be self sustaining. TRADOC also specified that the light infantry divisions must, "optimize designs for low to mid-intensity conflict, but retain usefulness in NATO."⁵⁹

General Wickham's 1984 White Paper laid out his broad concept for employment of light infantry. He expected light infantry to, "fight-- anytime, anywhere, and against any opponent."⁶⁰ Light infantry would exploit its offensive-mindedness normally attacking by infiltration, air assault, ambush, and raid, all at night, and in the most difficult terrain. Light infantry must fight within the combined arms team capable of reinforcing all other types of forces. General Wickham expected high technology to enhance the divisions firepower and mobility, and he directed the integration of "lightness" into the Army's acquisition system.⁶¹ In November, 1983, within four months of the project's start, TRADOC produced a design concept for the light infantry division which met General Wickham's criteria and received his approval.⁶²

If a great deal of professional discussion regarding the role of light infantry divisions did not precede their creation, it certainly followed it.⁶³ Unsettled conditions in both the strategic environment and national military policies continue to complicate light infantry issues. Force design logically flows from an analysis of the threat. Although the absolute nature of threats generally fall easily onto the spectrum of conflict, those threats considered most likely change with political, economic, and military conditions. This presents force designers and operational planners with significant challenges, especially during times of severe budgetary constraints. The light infantry debate swirls around the *paradox between its intended purposes and its practical limitations.*

The light infantry divisions were created to meet strategic deployment requirements, and, at the same time, provide combat capability across a wide range of threats.⁶⁴ Consistent with General Wickham's intent, light infantry is supposed to fight anyone, anytime, anywhere.⁶⁵ Throughout the conceptualization, design, and fielding of light infantry divisions they have been portrayed as, "an all purpose force able to respond rapidly to a whole range of combat conditions from [low-intensity conflict] in the Third World to mid- to high-intensity conflict in Europe, from the deserts and mountains of Southwest Asia to the forests of Central America or the Plains of Germany."⁶⁶

The primary purpose of light infantry divisions is strategic mobility, providing a significant rapid deployment capability as a deterrent precluding or containing a crisis.⁶⁷ Light infantry divisions today are not far from General Wickham's original intent for strategic mobility. According to the Military Traffic Management Command, light divisions must move 10,871 personnel and 14,436 short tons of equipment in a deployment. Altogether personnel and equipment require 618 sorties of C-141 and an additional 18 sorties of C-5 aircraft.⁶⁸ Even though this sortie estimate is fully 136 above the 500 sortie limit set by General Wickham, light infantry divisions still enjoy significant strategic mobility advantages over heavier forces.⁶⁹

The value of light infantry as a credible deterrent is less well established. If merely used for deterrent purposes, light infantry can tolerate its firepower, tactical mobility, and sustainment limitations.⁷⁰ However, given the capability of the 82d Airborne Division, or the US Marines afloat around the world, the deterrent value of light infantry appears a redundancy within our force structure.⁷¹ Questions also arise

regarding the deterrent value of a force incapable of sustained combat operations at middle to higher levels of war.⁷²

Nonetheless, light infantry divisions were designed for both deterrent and warfighting missions.⁷³ In a report to Congress, the Army asserted that light infantry could attack to destroy enemy forces or seize terrain; defend to delay, disrupt, hold terrain, or destroy enemy forces; conduct operations in cities; or, conduct rear area operations when provided tactical mobility assets.⁷⁴ The Army's report does make the distinction that light infantry can perform all missions in any terrain against other light forces, and in close, difficult terrain against heavy forces. The light infantry division's capability, and, therefore, utility, across the spectrum of war has been a consistent Army theme.⁷⁵ The requirement that light infantry act as a general purpose force persists despite arguments that they cannot operate in that role,⁷⁶ or arguments that they should not operate in that role.⁷⁷

Regardless of light infantry's limited capability given their lack of tactical mobility, they will be called upon to perform general purpose force missions. So long as the Army has no standard middleweight regular infantry, light forces will receive those missions. In those situations in which protected mobility would be useful, augmentation with M113 APC's could make an exceptional contribution. For example, consider the value of a light infantry division mounted on M113 APC's during Operation Desert Storm in Southwest Asia. Such a force could have followed the heavy forces and provided support by clearing strong points, protecting flanks, or handling enemy prisoners. These functions alone may have measurably assisted maintaining the tempo of the force as a whole.

Augmentation of light forces is, and remains, the key to their utility in a theater of operations.

Force designers understood the trade-offs necessary in firepower, tactical mobility, and sustainment to achieve greater strategic mobility. The division's basic design retains only those assets considered absolutely necessary at all times. For occasionally required combat, combat support, or combat service support, designers:

Used an augmentation concept that placed specific capabilities in the division's parent corps structure. The augmenting organization would be able to "plug" in as the situation dictated...the key is that complementing and supplementing capabilities can be rapidly added to the division depending upon the needs of the situation.⁷⁸

Using this corps "plug" concept, proponents argue that light infantry, appropriately "augmented", make an adequate general purpose force suitable for contingencies at all levels of war.⁷⁹ Augmentation has always been an important, but not prominent, component of the light infantry concept. General Wickham mentioned augmenting light infantry for European or Southwest Asian scenarios.⁸⁰ General Vuono, Army Chief of Staff after General Wickham, spoke in terms of "tailoring" light forces for "operations across the spectrum."⁸¹ Augmentation, therefore, provides the linkage necessary for the relevance and potential utility of light forces to mid- and high-intensity warfare.

Augmentation, or the "plug" concept, presents another set of problems for light infantry. Immediately the concept of augmentation undermines the strategic mobility of light infantry. "Plugs" compete with combat forces and supplies for limited strategic lift assets.⁸² Augmentation assets may not always be available for the amount of light infantry that requires support. The lack of opportunities for augmentation

units to train with the units they may support weakens commitment to the "plug" concept. Augmentation by supporting units without habitual relationships with their supported divisions, results in confusion and inefficiency.⁸³ Despite these problems, augmentation remains the only alternative to enhance the tactical mobility of light infantry under the current organization.

Among all the employment limitations suffered by light infantry, tactical mobility remains its "greatest failing."⁸⁴ Light infantry doctrine plays down this limitation and emphasizes other attributes of light forces that contribute to their mobility:

More often [light forces] use night operations, terrain and poor weather to maximize its mobility. The division also capitalizes on the initiative and capabilities of its soldiers, its high standards of discipline, and the exacting training demanded by its leaders. The division uses all these capabilities to position its units in advantageous positions relative to the enemy and thereby gain a tactical mobility advantage over the enemy.⁸⁵

General Wickham, a former commander of the 101st Air Assault Division, envisioned that light forces would move tactically by "cycling" or, "moving by truck or helicopter one third or two thirds of the division at once, leapfrogging from one place to another."⁸⁶ Under this scheme, when one part of the division is moving by truck or air, the rest of the division is limited to foot mobility or stationary.

Light divisions are limited to three organic means of tactical mobility: foot, wheeled, and helicopter. Light infantry proponents argue that foot mobility is light infantry's greatest asset. For battles against static or foot mobile enemies, in very difficult terrain or limited visibility,

light infantry possesses the required tactical mobility. In virtually any other situation, the lack of tactical mobility is a great limitation.

Light divisions are unable to enhance their tactical mobility without augmentation. Each maneuver battalion in the light division has only thirty-five high mobility, multi-purpose wheeled vehicles (HMMWV), all of which are dedicated to critical combat, combat support, or combat service support requirements.⁸⁷ The division support command has a transportation motor transport (TMT) company within its supply and transportation battalion. This company has thirty-five five-ton cargo trucks and eight five-ton tractor trailers capable of carrying three companies of infantry at one time.⁸⁸ The division's aviation brigade has one assault helicopter battalion of thirty UH-60 Blackhawk helicopters.⁸⁹ The assault helicopter battalion can only carry three light infantry companies at one time.

The light division's tactical mobility, beyond walking, is limited to moving only one battalion by truck and one battalion by helicopter, thus leaving seven battalions on foot. Even if in an emergency the division pooled all of its HMMWV assets it could still only move three battalions at once leaving six battalions on foot. Tactical mobility as a division, beyond foot mobility, is only possible with augmentation.

The light division is organized to maintain and supply its organic vehicles, but does not have the personnel or equipment, nor carry the supplies, necessary for sustained operations. A maintenance battalion and an aircraft maintenance company are only capable of meeting 50-percent to 75-percent of the division's expected repair or parts supply requirements.⁹⁰ The maintenance organizations are only 50-percent mobile themselves. A supply and transportation battalion and three

forward support battalions can store 58,000 gallons and deliver 32,000 gallons of bulk fuel per day. During offensive operations a light division will consume two times more fuel, and in the defense one and one half times more fuel, than it can deliver in one day.⁹¹

Light divisions focus their mobility skills training on dismounted infiltration and air-assault operations. Occasionally, light infantry will train with heavy forces and move on trucks provided by the heavy force. Even with heavy forces, however, their tactical employment usually calls for infiltration or air-assault.⁹² Light forces infrequently pool their organic wheeled vehicles for tactical mobility⁹³, therefore they do not regularly train for mounted operations. Outside their fundamental foot and air assault capabilities, there is no evidence that light infantry skills are developed for any other type of tactical mobility.

This analysis highlights the light infantry division's organic tactical mobility weaknesses. Using the tactical mobility framework light forces clearly cannot move 100-percent of its combat power at any one time other than on foot, they cannot sustain their organic mobility assets beyond 48 hours, and, although skillful at infiltration and air assault, they are not well prepared to employ other mobility means.

If light infantry proponents want to make the case that they are capable, with augmentation, across the spectrum of conflict, then providing them with M113 APC's is a legitimate concept. Light infantry requires augmentation to perform all its missions, especially economy of force missions at levels above the lowest intensity. Augmentation for tactical mobility, other than helicopters and trucks, has not been given adequate consideration.

The relevance of light infantry division employment above low-intensity conflict depends upon well planned and organized augmentation. The Army tried a system of augmenting infantry with non-organic APC's during the Pentomic Era of the late 1950's. An examination of that experience provides useful insight regarding the advantages and disadvantages of such a system.

IV. The Case of the M59 and the Pentomic Division

After the Korean War the Army wrestled with two disheartening prospects: the nuclear battlefield and severe defense budget constraints. The security environment was characterized as a time of "nuclear plenty," the pace and scope of nuclear development was rapid at each level of war. Both the United States and the Soviet Union were capable of strategic and tactical nuclear warfare.⁹⁴ At the same time, civilian leaders were unwilling to support army forces capable of fighting every kind of war at all times.⁹⁵ Consequently, the Army's modernization emphasis went to missile and nuclear delivery technology, while conventional capabilities lagged behind in quality and quantity.⁹⁶ The Army's primary tactical concern was to secure the force on the nuclear battlefield, primarily through dispersion in order not to present a large target, followed by quick consolidation to exploit the effects of friendly nuclear fire.⁹⁷ Fighting a fluid battle over extended depths and times required great flexibility and mobility in the divisional structure. A new "Pentomic" division was organized to provide greater strategic mobility, firepower, tactical mobility, and improved communication.⁹⁸

The Pentomic division reduced the overall size of the infantry division in personnel and equipment, yet increased foxhole strength.⁹⁹ Instead of three infantry regiments, the Pentomic division had five battle groups allowing better command and control over a widely dispersed battlefield. Although the number of vehicles was reduced with the overall strength, better mobility was achieved by leaner and lighter infantry battle groups and pooling M59 armored personnel carrier companies and a light truck company in a division transportation battalion.¹⁰⁰

The M59 armored personnel carrier was a lightly armored, fully tracked, amphibious personnel carrier capable of carrying twelve to sixteen infantrymen.¹⁰¹ Despite its heavy weight, 41,800 pounds, the M59 had good cross country mobility, could get up to 32 miles per hour, had a cruising range of 120 miles, and was air transportable in the C-124 aircraft. The M59 was intended for battle transportation only; infantry was still required to fight dismounted.¹⁰²

The M59 was not organic to the infantry battle groups of the division. The Pentomic concept pooled equipment that was needed only "intermittently" for distribution to the battle groups as required.¹⁰³ APC's were pooled in two armored personnel carrier Companies in the divisional transportation battalion.¹⁰⁴ Each APC Company had three platoons of nineteen carriers each. APC drivers were transportation corps soldiers and stayed with their vehicle regardless of attachment. One carrier platoon could carry one rifle company. The six carrier platoons of the two carrier companies could carry only one of the division's five infantry battle groups. One other battle group could be carried by the eighty 2-1/2 ton trucks of the Light Truck Company in the Transportation Battalion.¹⁰⁵

Although the Pentomic division was more mobile than its World War II predecessor, it was still well short of being one hundred percent mobile. The division commander had to consider carefully how to employ his limited mobility assets.¹⁰⁶ APC's were ordinarily attached or placed under the operational control of the infantry battle group or companies which needed the greatest mobility: tank-infantry teams, covering forces, or mobile reserves. Army leadership stressed that infantry could not fight mounted in APC's or helicopters, nor were there enough APC's for mobility at all times.¹⁰⁷ An experimental study by the Army in late 1957

gave some support to this concept when it found no significant difference in the combat effectiveness of companies organized with APC's attached or organic.¹⁰⁸

The problems with pooling, as a system for providing tactical mobility to maneuver units, became apparent as the Army grew more familiar with the Pentomic structure. The response from the field was not as inconclusive at the experiments in 1957.

Colonel Frank Izenour, head of the tactics department at the Infantry School in 1958, expressed shock at the assignment of the "infantry personnel carrier" to the transportation corps.¹⁰⁹ Echoing comments he heard from the field, Colonel Izenour noted that APC's in a transportation battalion were illogical; the APC has a combat role, not merely transportation. He drew an important distinction between "transportation" and "combat mobility". The APC, he argued, is a weapon and should be treated as one.¹¹⁰ He also noted the lack of association and teamwork required to build cohesion between the infantry squad and the transportation driver. Given the tactical employment of each APC, the driver truly needed to be infantry; it would be easier to train an infantryman to drive an APC than to train a driver to be an infantryman.¹¹¹

Lieutenant Colonel Albert Seifert, an armor officer teaching at the Infantry School, echoed Colonel Izenour's concern about non-organic APC's and infantry units.¹¹² He asserted that units are at their best when they know what to expect, and argued that attaching APC's to regular infantry companies unhinges their normal routine:

At the very time when the commander wants to exploit tactical advantage, he must load his men in unfamiliar vehicles, driven by men he does not know...¹¹³

Other problems were voiced from the field. Due to equipment failure or poor calculation, battle groups and companies were never certain to get enough APC's attached to make their unit 100-percent mobile.¹¹⁴ Organic combat and combat support vehicles in the battle groups were wheeled resulting in an unbalanced mix of tactical vehicles difficult to maneuver together.¹¹⁵ Carriers could not secure themselves.¹¹⁶ Not all carriers had radios which caused companies to reconfigure communication assets to assure positive mounted control.¹¹⁷

One of the greatest complaints was that carriers were attached to battle groups without additional maintenance support.¹¹⁸ The transportation battalion was responsible for carrier maintenance except when they were detached. The receiving battle group's organic maintenance section picked-up the responsibility upon attachment—but without any help. The frustration this could cause infantry commanders was apparent.¹¹⁹ Although a relatively reliable and easy to maintain APC, to infantry commanders the attachment of M59's represented a maintenance headache.

Solutions recommended for these problems were within the equipment and personnel constraints identified by the Army's leadership. Colonel Izenour recognized the limited number of APC's available and decided that pooling was an acceptable system. He recommended, however, organization of the carrier companies into a "tactical transportation battalion" commanded and staffed by infantrymen.¹²⁰ He also called for a maintenance slice to accompany carriers when detached

to battle groups. Another recommendation argued for the complete and permanent mechanization of one battle group.¹²¹ The Pentomic division would then have four infantry battle groups, one armored infantry battle group, and one tank battalion.

The Pentomic division had barely made its way to the field when tactical mobility based upon a pooling system came under attack. Clearly, its three greatest failings were that the Pentomic division could not provide tactical mobility support to all its maneuver units, attachment of M59's did not also provide the means for maintaining and sustaining the APC's, and M59 drivers were not competent infantrymen. These three factors undermined the infantry unit's confidence in the system. Army leadership recognized this problem and at the 1958 World Wide Infantry Conference they concluded that APC's must be provided organic to the battle groups for personnel and crew served weapons.¹²²

In 1956, just prior to the Army's conversion to the Pentomic concept, Lieutenant Clinton Granger wondered what the infantry was trying to do?¹²³ Armored, light, motorized, or airborne, no individual type of infantry are by themselves a solution; each represents a simplification of a tactical mobility problem. Lieutenant Granger argued that the Army needs all types of infantry: armored, mechanized, airborne, helicopter, and light. The Army has come full circle; problems today echo those of 1956. The challenge remains to provide infantry units the tactical mobility necessary and appropriate to the tactical situation. Situations that require protected ground mobility for infantry forces are not unlikely. Augmentation with M113 APC's may still provide the linkage necessary to the versatility of today's light infantry.

V. M113 Augmentation for Light Infantry Forces

In reviewing the professional literature regarding modern light infantry two striking commonalities are apparent. First is the general recognition that light forces have severe tactical limitations, that they are in fact too light to fight and win except in the most favorable conditions. Second, given this recognition, many writers call for the creation of "middle-weight" forces to fill the capability gap in our current light and heavy structure.¹²⁴ All the authors argue for a separate divisional structure to create a middle-weight force. This section briefly outlines four of these approaches then offers another using only augmentation.

General Wass de Czege lays out a paradigm for infantry force structure that seeks to, "resist the trend toward only two types of infantry-- armored and light," and argues for a return to regular infantry.¹²⁵ He identifies requirements for armored infantry, fighting mounted or dismounted, to support tank forces; regular infantry, tactically supported by tanks, to hold ground, force penetrations, follow and support armored forces, and seize fortified positions; and, light infantry strategically, operationally, and tactically mobile, such as airborne and air assault, capable of traditional light infantry missions. Regular infantry fills the heavy-light gap. Tracked and wheeled protected vehicles provide regular infantry greater operational and tactical mobility to move troops and heavy equipment. Most important, however, regular infantry always fights dismounted.¹²⁶

John Adams, a civilian military consultant, essentially echoes General Wass de Czege but uses different labels.¹²⁷ What General Wass de Czege calls regular infantry, Adams calls mechanized light

infantry because they would ride in M113 APC's then dismount to perform all light infantry missions. Adams proposes a permanent reorganization of light infantry units into mechanized light infantry brigades or battalions. Augmentation, he argues, is an inadequate solution because of training complications.¹²⁸

Michael Mazarr, a civilian military analyst, advocates the creation of light armored or light mechanized divisions.¹²⁹ Army officer Peter Herrly called for the retention of the motorized concept under development in the 9th Infantry Division.¹³⁰ Both authors cite the requirement for heavier light forces. New vehicle and weapon technology is available to meet strategic deployability requirements without too great a trade-off of firepower and tactical mobility.

Reserve Army officer Allen Tiffany argues for the creation of light infantry brigade task forces within light divisions by making organic those augmentation units which would inevitably be attached in a crisis.¹³¹ If the light infantry brigade is going to be augmented anyway, he asserts, build-in its potential augmentees immediately to take advantage of training time to build teamwork.

Despite widely recognized requirements for tactically mobile infantry forces as evident in the articles discussed above, augmentation of light divisions has received no serious attention as a potential solution. The consensus in the literature repeats General Meyer's 1979 assertion that augmentation, either packaging or pooling, is an unacceptable solution for providing the organic mobility capabilities the light division requires.¹³² The problems already noted with augmentation--competition for strategic mobility assets, reliable availability, and inefficiency due to the lack of habitual relationships--are not insurmountable with careful

organization and planning. The decision to augment light infantry with any kind of tactical mobility must be carefully considered. Augmentation must be for a specific tactical purpose, not as a matter of principle. Commanders must understand the trade-offs and limitations associated with augmenting light forces with APC's, such as the probable lack of the mobility skills necessary for conducting mounted assaults. Finally, commanders must provide time for training, especially in the theater they intend to be employed. Augmentation could provide an adequate solution to the light infantry tactical mobility problem if it were given a reasonable chance.

The M113A3 APC is an excellent, economical option for augmenting light infantry. As armored and mechanized infantry divisions have modernized to the M2 Bradley Fighting Vehicle (BFV), hundreds of M113's have become available for reallocation.¹³³ The rest of this section outlines the equipment capability of the M113A3, the organization which could provide for the availability, maintenance, and sustainment of a M113 augmentation package, and, finally, suggests a means of ensuring that light infantry have the mobility skills necessary for M113 employment.

The M113A3 is a lightly armored, fully tracked, amphibious personnel carrier capable of carrying twelve infantrymen.¹³⁴ Its compact size and weight, only 27,1800 lbs., make the M113A3 easily air transportable in C-130, C-141, or C-5 aircraft. The M113A3 has excellent mobility, comparable to the M2 Bradley in range, speed, and quickness across a variety of surfaces and conditions.¹³⁵ The combination of range (309 miles), speed (40 mph), and reliability (1,800 average miles before mechanical failure) make the M113A3 an adequate means for both

tactical and operational mobility. More than 75,000 M113 APC's have been produced over the last thirty years.¹³⁶ They are the most widely used APC in the world and can be found in the armies of over fifty nations.

In addition to its impressive mobility, the M113A3 can mount all the light infantry crew served weapons: M47 Dragon Medium Anti-tank Weapon, M60 Machinegun, and M249 Squad Automatic Weapon. The M113A3 can also mount the M2 50-caliber Machinegun and the MK19 40-mm Grenade Machinegun, firepower not ordinarily found in light infantry units.

The Army could configure M113A3's in company, battalion, and brigade packages much like equipment is organized in POMCUS and Maritime Prepositioned Sets. In this concept a theater commander could make a determination during deployment, or, more likely, after the theater has matured, whether mobility augmentation is required for light infantry to perform economy of force missions, i.e., rear area or flank security. The M113A3 packages, in a variety of unit sizes, are readily available to deploy by air or sea with its necessary combat service support. Although ready for relatively quick shipment either by air or sea, these packages are not intended to be part of the light infantry division's most rapidly deployable force. M113 package deployment is based upon the theater commander's decision regarding the flow of deployment and the best use of light forces in a maturing theater.

The essential elements of any size package would include APC's with the appropriate maintenance and supply personnel and equipment. A company package would consist of fifteen APC's: one APC for each infantry squad, and one each for the company commander, executive

officer, platoon leaders, and a maintenance recovery vehicle. A company package would come with its own direct support maintenance and fuel supply sections. (See Figure 1.)

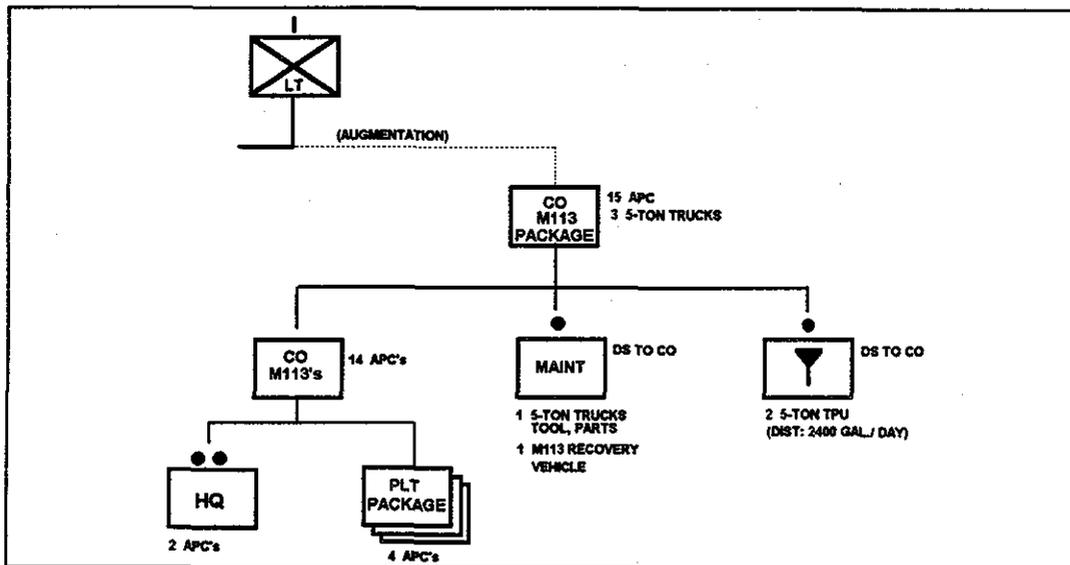


Figure 1. Company Size M113A3 APC Augmentation Package

A battalion package consists of fifty-two APC's, including the three company packages, plus four APC's for the scout platoon, and one each for the commander, executive officer, S-3 operations officer, and a recovery section. The battalion package also includes direct support maintenance and fuel supply sections. (See Figure 2.)

A brigade package totals 158 APC's, including three battalion packages, plus additional maintenance and fuel supply command and control assets in support of its own Forward Support Battalion. (See Figure 3.) The light division, with three augmented brigades, would have 474 APC's and an additional 117 5-ton trucks and fifteen HMMWV's.¹³⁷ This would require augmentation to its Division Material Management

Center (DMMC) and Division Support Command (DISCOM) to assist in management, command, and control of the sustainment effort.

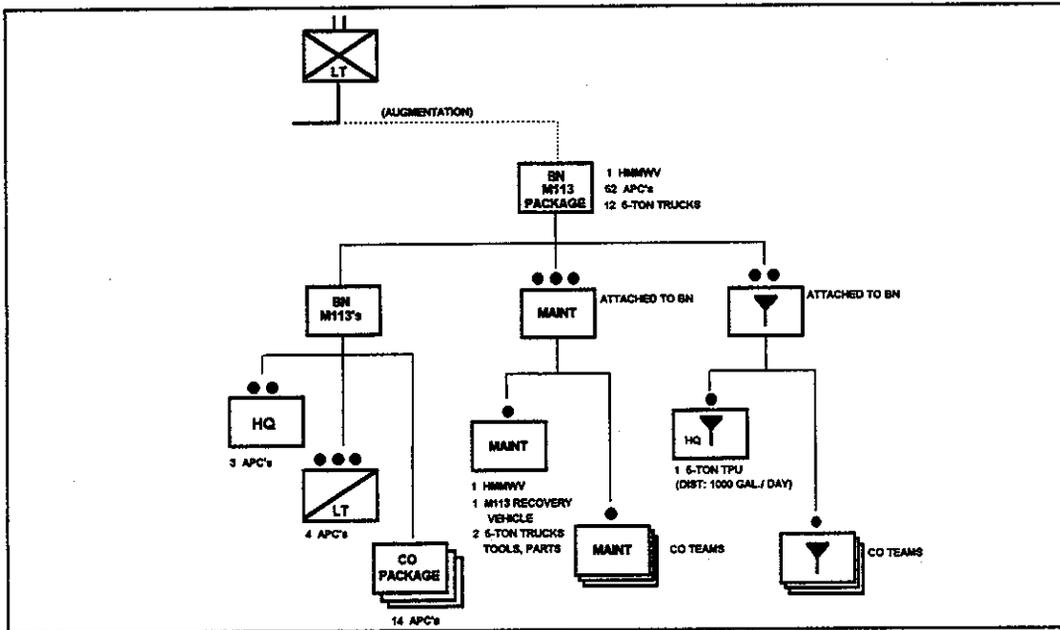


Figure 2. Battalion Size M113A3 APC Augmentation Package

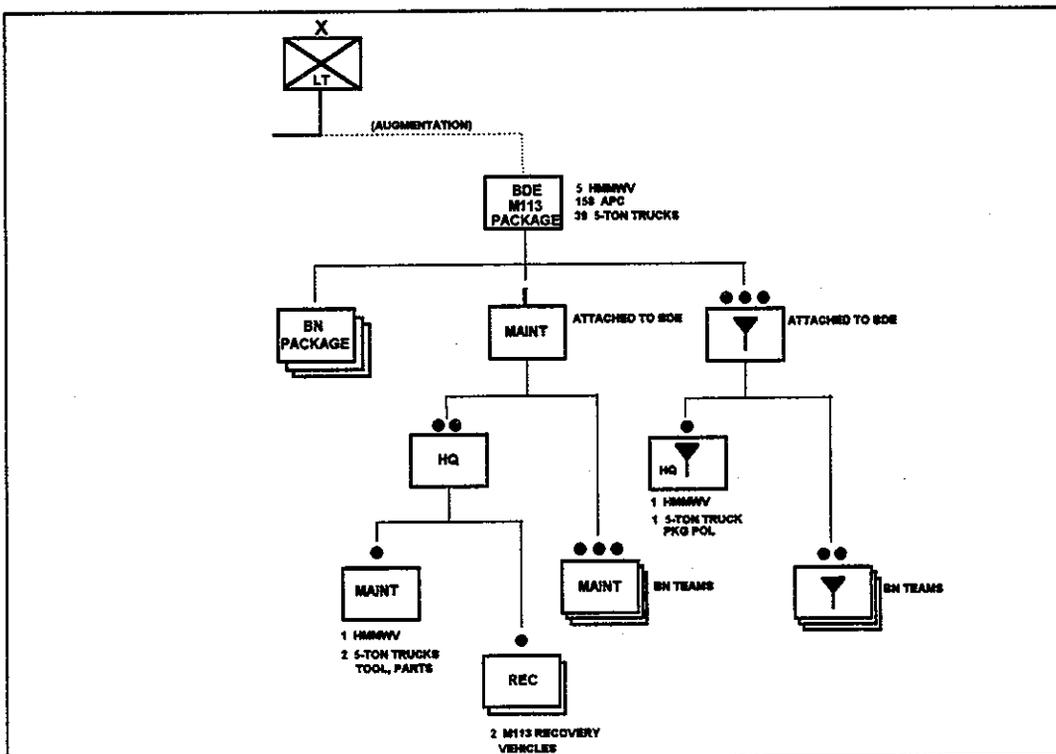


Figure 3. Brigade Size M113A3 APC Augmentation Package

All personnel in these packages--an infantry driver for each APC, as well as maintenance and supply managers, mechanics and fuel handlers for the support sections--would come from the US Army Reserve and have responsibility for the storage, maintenance, deployment, and redeployment of the packages. This concept actually mirrors that proposed by COL Izenour in 1958: a tactical transportation unit with infantry drivers for the APC's.

Training in the mobility skills required for mounted operations to light infantry soldiers presents an interesting challenge. It is important to focus training at all levels on personnel and equipment safety and only the most fundamental mounted planning and operations tasks. In this concept M113A3 augmentation is merely additional tactical mobility for light infantry in its economy of force roles. As such, light infantry would not be expected to conduct complex mounted maneuvers or assaults. The M113A3 is truly a battle taxi; the infantry always dismounts to maneuver and fight. One condition which may mitigate against these training challenges is that infantry officer assignment policy requires a mix of heavy and light experience. Company and field grade light infantry leaders and planners will have had useful mounted experience facilitating the integration and employment of augmenting APC's.

Given the intended employment of APC's, actual training need only achieve a level of familiarity for soldier safety and to build confidence in mounted mobility skills (i.e., road marching day and night, land navigation, mount-dismount drills, weapons firing, etc.). This could be accomplished by pooling fifteen APC's at light infantry installations for squad and platoon training. A battalion package could be positioned at the National Training Center to allow light infantry some time for company

and battalion level mounted training during heavy-light rotations. A training period in theater would be a critical element of any augmentation plan once the decision has been made to enhance light infantry mobility with APC's.

This augmentation concept meets the criteria established earlier for enhancing the tactical mobility of light infantry. M113A3's provide an economical means to make light infantry relevant across the spectrum of conflict, particularly in its economy of force roles in mid- to high-intensity conflict. There are sufficient M113A3's available to provide 100-percent mobility to the maneuver battalions of a light division. Maintenance and sustainment personnel and equipment are easily organized to provide necessary support. Finally, the M113A3 system is simple enough that training to achieve the mobility skills required for troop safety and successful employment are manageable.

VI. Conclusion

Versatility, as a tenant of US Army operations, requires that all forces, heavy and light, possess the intellectual and physical capability, and more importantly the willingness, to accept roles and missions across the wide spectrum of military activity. Light infantry are a critical part of the total force and represent the Army's most adaptable formation to meet these challenges. This monograph has demonstrated, however, that light infantry have limited utility beyond the lowest-intensity conflicts in the most restricted terrain without significant tactical mobility augmentation.

Unfortunately, the most likely threats which might require the commitment of US forces are well armed and more mobile than our current light infantry organization. Light infantry are at a significant tactical disadvantage when deployed against a moderately armed or armored force. Given the lethal and mobile nature of a wide range of possible adversaries, the challenge is to find a way to capitalize on the strategic mobility and adaptability of light forces and provide them the means for relevance and utility at the middle and higher levels of conflict. Augmenting light infantry with M113A3 APC's has been suggested as an feasible and economical way to achieve this. The M113A3 is a superb and available battle taxi that emphasizes mobility over heavy protection preserving its strategic deployability.

The augmentation of light infantry has been criticized, however, as undesirable and unworkable. Any effort to make these specially trained light infantry heavier or more like 'regular' infantry should be resisted, as a matter of principle more than for any operational requirement.¹³⁸ To ignore the versatility that augmented light infantry represent for the Army

as a whole is an unnecessary self-imposed restraint on our capability across the spectrum of war. Opponents have argued since World War II that augmentation is unworkable.¹³⁹ The evidence suggests, however, that augmentation systems have not seriously attempted to work through the problems of training or sustainment. The Army did not provide adequate planning or organization to make the augmentation system work during the Pentomic Era. One can imagine the versatility that light infantry augmented with APC's might have contributed to operations during the Gulf War. Light force's resistance to augmentation in general underscore the requirement for commanders to consider carefully the conditions under which they may use light infantry.

Light infantry, mounted in readily available M113's and used in their economy of force role on the mid- to high-intensity battlefield is a tactical concept worthy of further study. The consensus regarding light infantry's limited capability, and the growing consensus regarding a gap in the Army's structure for mid-intensity conflict clearly suggest the need to explore feasible and economical options and solutions. Organizational and training challenges for light infantry with M113's are not insurmountable. Parochial bureaucratic resistance may be the greatest *hurdle to overcome*; *light infantry proponents are well established and have successfully avoided change so far*. Nonetheless, an infantry force capable of foot mobility or mounted mobility in M113's could give the Army tremendous versatility in a variety of situations.

Appendix A: Vehicle comparison M113A3 APC and M2A2 Bradley Fighting Vehicle.

VEHICLE CHARACTERISTICS: M113A2, M113A3 & M2A2 BFV

<u>UNIT</u>	<u>M113A2</u>	<u>M113A3</u>	<u>M2A2 BFV</u>
Weight	25,000	27,800	66,000
Speed (Level)	35 mph	42 mph	40 mph
Cruising Range	300 mi	300 mi	300 mi
Engine	212 hp	275 hp	600 hp
HP/Ton	16.7	19.8	18.2
Interior Volume	276 ft ³	292 ft ³	320 ft ³
Reliability (MMBF)	850	1800	500

ARMOR PROTECTION COMPARISON: M113A3 & M2A2 BFV

	<u>M113A3</u>	<u>M2A0 BFV</u>	<u>M2A2 BFV</u>
SIDES	14.5mm	14.5mm	30MM
FRONT	14.5mm	14.5mm	30MM
REAR	14.5mm	14.5mm	14.5mm
TOP	155MM FRAG	155MM FRAG	155MM
FRAG			
SPALL	Yes w/stand off	No	Yes

M113A3 -- M2 BFV MOBILITY COMPARISON

	<u>M113</u>	<u>BFV</u>		<u>M113</u>	<u>BFV</u>
<u>AIR</u>			<u>LAND</u>		
C-130	Yes	No	Trench X'ing(m)	1.7	2.5
LAPES	Yes	No	Vertical Obst(m)	0.6	0.9
LVAD	Yes	NO	Gradient (%)	60	60
C-141	Yes	Reviewing	Turn Rad(m)	Pivot	Pivot
			Veh Cone Index	17	15
			Ground Clear(in)	16	17.5

Appendix A: Vehicle comparison M113A3 APC and M2A2 Bradley Fighting Vehicle.

Average Speed Profiles for Selected Geographical Areas

<u>Percent Area Crossed</u>	<u>FRG Dry</u>		<u>FRG Wet</u>		<u>SWA</u>	
	<u>M113</u>	<u>BFV</u>	<u>M113</u>	<u>BFV</u>	<u>M113</u>	<u>BFV</u>
50%	22	23	15	15	18	18
60%	20	21	14	14	16	16
70%	18	19	13	13	13	13
80%	16	17	10	10	2	3
90%	14	14	0.9	0.9	0.6	0.7
100%	1.1	1.4	0.5	0.9	---	---

Percent Area NO GO

	<u>FRG Dry</u>	<u>FRG Wet</u>	<u>SWA</u>
M113	8	20	23
BFV	9	19	22

Vehicle Speed (mph) VS Surface Roughness

<u>RMS Roughness (in)</u>	<u>M113</u>	<u>BFV</u>
0.0	41	41
1.0	33	35
2.0	18	22
3.0	13	16

Appendix A: Vehicle comparison M113A3 APC and M2A2 Bradley Fighting Vehicle.

<u>Vehicle Speed (mph) At 2.5g Acceleration VS Obstacle Height</u>		
<u>Obstacle Height(in)</u>	<u>M113</u>	<u>BFV</u>
0	41	41
8	41	41
10	13	41
12	6	41
15	3	12

<u>Acceleration Performance (Speed&Distance) On Selected Soil Strength</u>					
<u>Soil Strength</u>	<u>Time(sec)</u>	<u>Speed(Mph)</u>		<u>Distance(ft)</u>	
		<u>M113</u>	<u>BFV</u>	<u>M113</u>	<u>BFV</u>
50 RCI(soft)	10	20	20	208	201
	20	24	22	533	538
	30	26	24	900	878
300 RCI(hard)	10	25	24	246	238
	20	33	32	682	661
	30	37	35	1197	1167

ENDNOTES

¹The literature on this debate is large and still growing. A good place to start is William B. Caldwell, "Not Light Enough to Get There, Not Heavy Enough to Win: The Case of US Light Infantry," Monograph, School of Advanced Military Studies, December 4, 1987.

²General John A. Wickham, White Paper 1984: Light Infantry Divisions, (Washington, D.C.: Department of the Army, April 16, 1984), 1; Army Light Infantry Divisions, testimony before the Subcommittee on Procurement, Committee on Armed Services, US House of Representatives, 98th Congress, Second Session, (Washington, D.C., March 29, 1984), 877-879 and 883.

³Sam Damon and Ben Krisler (pseudonyms), "Army of Excellence: A Time to Take Stock," Armed Forces Journal International, (May 1985): 86-87.

⁴*Ibid.*, 86.

⁵Jeffrey Record, "The US Army in the Post-Cold War Era", Strategic Review, (Summer 1991): 76.

⁶*Ibid.*, 81.

⁷Michael Howard, "Military Science In An Age of Peace", Chesney Memorial Gold Medal Lecture, October 3, 1973.

⁸Eliot Cohen and John Gooch, Military Misfortunes: The Anatomy of Failure in War, (New York: The Free Press, 1990), 27.

⁹Michael Mazarr, Light Forces and the Future of U.S. Military Strategy. (New York: Brassey's (US) Inc., 1990), 40.

¹⁰Timothy Hassell, Army of Excellence, Final Report, Volume II: The Light Infantry Division. Fort Leavenworth, Kansas: US Army Combined Arms Combat Development Activity, 29 June 1984), 1-5 and 2-6.

¹¹Mazarr, Light Forces, 37.

¹²The Compact Edition of the Oxford English Dictionary, vol. 1., (New York: Oxford, 1979), 561

¹³Letter from the Commandant, US Command and General Staff College, Subject: Mobility, February 27, 1960, to Commanding General US Continental Army Command, Fort Monroe, Virginia, inclosure 1, page 2.

¹⁴Science Information Resource Center, The Official Dictionary of Military Terms, compiled by the Joint Chiefs of Staff, (Washington, D.C.: Hemisphere Publishing Corp., 1988), 238. [Reprint of JCS Pub 1]

¹⁵Dictionary of Military Terms, compiled by Trevor Dupuy, Curt Johnson, and Grace Hayes, (New York: H.W. Wilson, 1986), 151

¹⁶ibid., 214.

¹⁷Edward Luttwak and Stuart Koehl, The Dictionary of Modern War, (New York: Harpers, 1991), 401.

¹⁸ibid., 404.

¹⁹ibid.

²⁰ibid., 405.

²¹ibid.

²²Peter Heerly, "Middleweight Forces and the Army's Deployability Dilemma," Parameters (September 1989): 47.

²³US Army. Training and Doctrine Command Pamphlet 11-9, Blueprint of the Battlefield. (Fort Monroe, Virginia: HQ US Army TRADOC, 15 February 1991), 7-1.

²⁴Huba Wass de Czege, Understanding and Developing Combat Power, (Fort Leavenworth, Kansas: School of Advanced Military Studies, 10 February 1984), 7.

²⁵ibid., 1.

²⁶ibid.

²⁷ibid., 7.

²⁸ibid., emphasis in the original.

²⁹ibid., 8.

³⁰ibid.

³¹ibid., 18.

³²ibid., 18-19.

33 *ibid.*, 18.

34 *ibid.*

35 Foreign Military Studies Office, "Future Threats and Challenges", Foreign Military Studies Office Issue Paper No. 3, (Fort Leavenworth: Combined Arms Command, 6 November 1991): 1.

36 *ibid.*, 3.

37 David Glanz, "Challenges of the Future: Developing Security Issues in the Post Cold War Era." Military Review (December 1991): 4.

38 *ibid.*, 3.

39 Foreign Military Studies Office, 4.

40 CSIS Conventional Combat 2002 Project, Conventional Combat Priorities: An Approach for the New Strategic Era, (Washington, D.C., May 1990), 20

41 *ibid.*, 23.

42 Carl Vuono, "The United States Army is a Strategic Force," Armed Forces Journal International (February 1989): 61.

43 See for example Michael Mazarr, "Middleweight Forces for Contingency Operations", Military Review (August 1991): 36; Allen Tiffany, "A 'Light' Infantry Division With More for the Fight," Military Review, (August 1991): 41. Authors writing since Operations Desert Shield and Desert Storm have usually been critical of the light infantry concept in order to make a case for middleweight forces.

44 Mazarr, "Middleweight Forces," 36

45 Herrly, 47.

46 US Army, "FM 100-5, Operations (Preliminary Draft)", (Washington, D.C: Headquarters, Department of the Army, 21 August 1992), 2-10.

47 A serious review of the light infantry literature is needed to synthesize and analyze the tremendous intellectual effort this issue has generated over the last ten years.

48 Caldwell, 36-37.

49 John Romjue, A History of Army 86: The Development of the Light Division, the Corps, and Echelons Above the Corps. (Fort Monroe, VA: HQ, US Army TRADOC, December, 1981), 25.

50 Ibid.

51 Edward Meyer, White Paper 1980: A Framework for Molding the Army of the 1980's into a Disciplined, Well Trained Fighting Force. (Washington, D.C.: Department of the Army, 1980), 1.

52 David Isby, "US Army's New Light Infantry Division: The Quest for Strategic Mobility and Combat Power," in Ian Hogg, ed. Jane's Military Review, 5th Edition (London: Jane's Publishing Company, 1986), 96.

53 Mazarr, Light Forces, 9.

54 Wickham, 1.

55 Mazarr, Light Forces, 31-32.

56 Ibid., 34.

57 Timothy Hassell, Army of Excellence, Final Report, Volume II: The Light Infantry Division. Fort Leavenworth, Kansas: US Army Combined Arms Combat Development Activity, 29 June 1984), 1.

58 Ibid., 1-4 to 1-6.

59 Ibid., 1-6.

60 Wickham, 1.

61 Ibid., 2.

62 Hassell, 1-1.

63 Olson, 5-6; Mazarr, Light Forces, 35.

64 Mazarr, Light Forces, 43-44.

65 Wickham, 1.

66 Olson, 4.

⁶⁷Peter Boylan, "Power Projection, Risk and the Light Force," Military Review, (May 1982): 64; Louis Huddleston, "Light Infantry Division: Azimuth Check." Military Review (September 1985): 15; Allen Tiffany, "Light Infantry Divisions with More for the Fight," Military Review, (August 1991): 41-42.

⁶⁸Department of Defense, MTMCTEA Reference 92-700-2, Logistics Handbook for Strategic Mobility Planning, (Newport News, Virginia: Military Traffic Management Command Transportation Engineering Agency, September 1992), Personnel estimate, 10; Sortie estimate, 57.

⁶⁹For example, a mechanized division requires 1,065 sorties of C-141, and 757 sorties of C-5 aircraft. Department of Defense, MTMCTEA Reference 92-700-2, 57.

⁷⁰Tony Velocci, "The New Light Division: Will it Work?" National Defense, (November 1984) 56.

⁷¹Mazarr, Light Forces, 46, 54-59; Harry Summers, On Strategy II: A Critical Analysis of the Gulf War, (New York: Dell Publishing, 1992), 261-262.

⁷²Robert Killebrew, "NATO, Deterrence, and Light Divisions," Military Review (May 1985): 6; Barry Blechman and Stephan Kaplan, Force Without War: US Armed Forces as a Political Instrument. (Washington, D.C.: Brookings Institution, 1978), 95-98.

⁷³Mazarr, Light Forces, 46.

⁷⁴US Army, "The Army's Long Range Plans for Fielding Light Divisions," Report to the Congress of the United States, April 1985, Appendix 1 to Annex A, A6, cited in David Poston, "Light Infantry Augmentation to Heavy Divisional Forces in Europe: A European Heavy-Light Primer," (MMAS Thesis, US Army Command and General Staff College, 1989), 36-37.

⁷⁵Carl Vuono, "The United States Army is a Strategic Force," Armed Forces Journal International, (February 1989): 61.

⁷⁶Caldwell, 36-37; Eshel, 63, Tiffany, 41; Olson, 4.

⁷⁷Huddleston, 21; Edward Luttwak, Strategic Utility of Light Divisions. A Systematic Evaluation: Final Report, (Chevy Chase: Edward Luttwak, Inc., 1985), 12-13; Edward Luttwak, "Light Infantry: The Army's Most Important Initiative?" Armed Forces Journal International, (May 1987): 8.

78Hassell, 1-5 and 2-6.

79Mazarr, Light Forces, 48.

80Wickham, 1-2.

81Vuono, 61.

82Damon and Krisler, 92; Olson, 11.

83Caldwell, 15.

84Mazarr, Light Forces, 37

85US Army, Field Circular 71-101, Light Infantry Division Operations, (Fort Leavenworth: US Army Command and General Staff College, 31 July 1984), 4-20

86Ibid., 34.

87US Army, Battle Book: US BDE/BN Task Force, Tactical Commanders Development Course, (Fort Leavenworth, Kansas: Command and General Staff College, 1991), M-10.

88US Army, Student Text 101-6, G1/G4 Battle Book, (Fort Leavenworth, Kansas: Command and General Staff College, 1 June 1991), 5-36.

89US Army, Battle Book, M-12.

90US Army, Student Text 101-6, 5-32.

91Ibid., 2-3.

92Herrly, 54.

93An interesting case is presented by LTC James Dubik, "A JRTC Defense: Light Infantry vs. TF Mech," Course Handout: A303 Light/Heavy Operations, US Army Command and General Staff College, AY 91-92. In this after action review of his battalion's defense at the JRTC, LTC Dubik employed a platoon mounted on "several 2-1/2 ton trucks" as a mobile reserve. The results were unsatisfactory--the movement of the OPFOR was faster than his decision to employ the reserve.

94Theodore Mataxis and Seymour Goldberg, Nuclear Tactics: Weapons, and Firepower in the Pentomic Division, Battle Group, and Company, (Harrisburg, Pennsylvania: The Military Services Publishing Company, 1958). ix.

95A.J. Bacevich, The Pentomic Era: US Army Between Korea and Vietnam, (Washington, D.C.: National Defense University Press, 1986), 38.

96Ibid., 100.

97Ibid., 66-68.

98"Why Five? Part I: Infantry Division," Infantry, (April 1957): 9.

99Ibid.

100Ibid., 10.

101Leland Andrews, "Chariot for the Queen," Infantry, (October 1956): 82.

102Ibid., 83.

103"Why Five? Part I: Infantry Division," 8.

104Paul Meuller, Jr. "Ride to Work," Infantry, (October 1957): 57.

105Ibid., 58.

106Ibid., 59.

107Armistead Mead, "What Will They Do in the Infantry?" Infantry, (October 1956): 91.

108US Army, Pentana-type Companies in Mobile Operations: Final Report, (Fort Ord, California: US Army Combat Development Experimentation Center, 11 July 1958): A10. The CARL number for this study is N-18397.41-A.

109Frank Izenour, "Put the Infantry Car in the Infantry Garage!" Infantry, (July-September 1958): 20.

110Ibid., 21.

111Ibid., 22.

- 112 Albert Seifert, "This Show is Not Rigged," Infantry, (June-July 1960): 68.
- 113 Ibid.
- 114 Mueller, 61.
- 115 Thomas Jones, "Rifle Company: Tactics for Offense," Infantry (July 1957): 25.
- 116 Mueller, 61.
- 117 Allen Buckner, "Beggars and Riders--and M59's," Infantry, (August-September 1960): 50.
- 118 Buckner, 49; Izenhour, 23; Seifert, 64.
- 119 Andrews, 83; Buckner, 50-51; Seifert, 69.
- 120 Izenhour, 23.
- 121 Seifert, 69.
- 122 "The 1958 World-wide Infantry Conference: A Report to Infantrymen," Infantry, (January-March 1959): 12.
- 123 Clinton Granger, "Infantry Emphasis--Where?" Military Review (April 1956): 64.
- 124 John Adams, "Heavy Versus Light Forces: A Middle Ground," Military Review, (October 1986): 64-73; Herry, "Middleweight Forces," 46-59; Huba Wass de Czege, "Three Kinds of Infantry," Infantry, (July-August 1985): 11-13; Michael Mazarr, "Middleweight Forces," 32-39; William Olson, 3-17; Allen Tiffany, 40-55.
- 125 Wass de Czege, "Three Kinds of Infantry", 13.
- 126 Ibid., 12.
- 127 Adams, 67-68.
- 128 Ibid., 69.
- 129 Mazarr, "Middleweight Forces," 32.
- 130 Herry, 57.

131 Tiffany, 47.

132 Romjue, 47.

133 US Army, M2/M3 Bradley Claimants (Briefing Slides), (Fort Leavenworth: US Army Combined Arms Command Combat Developments, February 1992), REQ (FY 95).

134 Ibid., 24.

135 US Army, "M113/M60 Family of Vehicles (Briefing Slides)", (Warren, Michigan: Tank-Automotive Command, January 1992). See also Appendix A.

136 US Army, Data Book: M113 Family of Vehicles, (Warren, Michigan: Tank-Automotive Command, April 1992), 2.

137 According to US Army, Student Text 100-1, Navy and Marine Corps, (Fort Leavenworth, Kansas: Command and General Staff College, 30 June 1991, 11-11) this additional equipment for a light division could all be moved at one time in approximately one third of the carrying capacity of one fast sealift ship. Based upon computations from Air Force Regulation 76-2, Airlift Planning Factors, (Washington DC: Department of the Air Force, 29 May 1987, 28-34) this equipment requires the following additional aircraft sorties:

Aircraft Sorties Required to Deploy M113 Packages				
<u>Aircraft</u>	<u>Company Pkg</u>	<u>Battalion Pkg</u>	<u>Brigade Pkg</u>	<u>Division Pkg</u>
C-130	18	64	202	606
C-141	9	32	101	303
C-5	5	14	51	153

138 Edward Luttwak, "Light Infantry: The Army's Most Important Initiative?" Armed Forces Journal International, (May 1987): 8

139 Caldwell, 14-17.

BIBLIOGRAPHY

BOOKS

- Blechman, Barry and Stephan Kaplan. Force Without War: US Armed Forces as a Political Instrument. Washington, DC: Brookings Institution, 1978.
- Bloch, Jean de. The Future of War in its Technical, Economic, and Political Relations. Boston: World Peace Foundation, 1914,. Reprinted by Combat Studies Institute, US Army Command and General Staff College, Fort Leavenworth, Kansas.
- Cohen, Eliot, and John Gooch. Military Misfortune: The Anatomy of Failure in War. New York: The Free Press, 1990.
- CSIS Conventional Combat 2002 Project. Conventional Combat Priorities: An Approach for the New Strategic Era. Washington, DC: Center for Strategic and International Studies, May 1990.
- English, John. On Infantry. New York: Praeger, 1984.
- Foss, Christopher. Editor. Jane's Armour and Artillery 1990-91. Eleventh edition. Alexandria: Jane's Information Group Inc., 1990.
- International Institute for Strategic Studies. The Military Balance, 1992-1993. London: Brassey's, 1992.
- Isby, David. "US Army's New Light Infantry Division: The Quest for Strategic Mobility and Combat Power." in Ian Hogg, ed. Jane's Military Review, 5th Edition. London: Jane's Publishing Company, 1986.
- Liddell Hart, Basil. The Future of Infantry. Harrisburg: Military Service Publishing Company, 1936.
- Luttwak, Edward. Strategic Utility of US Light Divisions: a Systematic Evaluation: Final Report. Chevy Chase: Edward Luttwak, Inc., 1985.
- Mataxis, Theodore and Seymour Goldberg. Nuclear Tactics: Weapons, and Firepower in the Pentomic Division, Battle Group, and Company. Harrisburg, Pennsylvania: The Military Services Publishing Company, 1958.
- Mazarr, Michael. Light Forces and the Future of US Military Strategy. New York: Brassey's (US), Inc., 1990.

- Simpkin, Richard. Mechanized Infantry. New York: Pergamon Press, 1980.
- . Race to the Swift. London: Brassey's Defense Publishers, 1985.
- Summers, Harry. On Strategy II: A Critical Analysis of the Gulf War. New York: Dell Publishing, 1992.
- Trythall, Anthony. Boney Fuller: Soldier, Strategist, and Writer 1878-1966. New Brunswick: Rutgers University Press, 1977.

ARTICLES

- Adams, John. "Heavy Versus Light Forces: A Middle Ground." Military Review. (October 1986): 64-73.
- Andrews, Leland. "Chariot for the Queen." Infantry. (October 1956): 78-87.
- Bahnsen, John. "Mr. President. We Can't Go." Armed Forces Journal International. (October 1987): 112-116.
- . "The Kaleidoscopic US Army." Armed Forces Journal International. (November 1985): 78-88.
- Besch, Edwin. "Are Our Light Divisions Too Light?" Army. (February 1985): 44.
- Bodelson, Patrick. "Design for Tempo: Part I." US Army Aviation Digest. (March-April. 1991): 2-16.
- Boudinot, Burton. "Ground Mobility Perspective." Armor. (January-February 1982): 39-40.
- Boylan, Peter. "Power Projection, Risk and the Light Force." Military Review. (May 1982): 62-69.
- Bradford, David. "Light Infantry." Infantry. (July-August 1986): 22-28.
- Bradley, Francis and Sanford Wilson. "Infantry's Mobility Crisis." Infantry. (July-September 1959): 4-6.
- Buckner, Allen. "Beggars and Riders--and M59's." Infantry. (August-September 1960): 49-51.
- Canby, Steven. "Light Infantry in Perspective." Infantry. (July-August 1984): 28-31.

- Cavezza, Carmen. "Tomorrow's Infantry." Infantry. (July-August, 1990): 1-2.
- Cushman, John. "Pentomic Infantry Division in Combat." Military Review. (January 1958): 19-30.
- Damon, Sam and Ben Krisler (pseudonyms). "Army of Excellence? A Time to Take Stock." Armed Forces Journal International. (May 1985): 86-100.
- DiGeorge, Phillip. "Training the Light Division." Infantry. (November-December 1989): 43-44.
- English, J.A. "Thinking About Light Infantry." Infantry. (November-December 1984): 19-25.
- Fish, Thomas. "The Infantry Spectrum: Crossing from Light to Mech." Infantry. (January-February 1990): 39-41.
- Fletcher, Robin. "Which Way for the Future MICV?" Military Technology. (March 1992): 47-50.
- Foss, John. "Training the Light Infantry Force." Infantry. (September-October 1984): 2.
- Glanz, David. "Challenges of the Future: Developing Security Issues in the Post Cold War Era." Military Review. (December 1991): 3-9.
- Greenwood, Thomas. "Light Infantry in Perspective." Marine Corps Gazette. (June 1991): 49.
- Hayden, H. T. "Light Infantry Revisited." Marine Corps Gazette. (June 1991): 47-49.
- Herrly, Peter. "Middleweight Forces and the Army's Deployability Dilemma." Parameters. (September 1989): 46-59.
- Holden-Reid, Brian. "J.F.C. Fuller and B.H. Liddel-Hart: A Comparison." Military Review. (May 1990): 64-73.
- House, Jonathan "Designing the Light Division, 1935-1944." Military Review. (May 1984): 39-47.
- Huddleston, Louis. "Light Infantry Division: Azimuth Check." Military Review (September 1985): 14-21.
- Hungate, James. "Tactics: Pentomic Infantry Division." Infantry. (July 1957): 11-13.

- , "Battle Group: Tactics for Offense." Infantry. (July 1957): 13-21.
- Izenour, Frank. "ROCID Changes." Infantry. (April-June 1959): 8-11.
- , "Put the Infantry Car in the Infantry Garage!" Infantry. (July-September 1958): 20-23.
- Jeffries, Lewis. "Blueprint for Force Design." Military Review. (August 1991): 20-31.
- Jones, Thomas. "Rifle Company: Tactics for Offense." Infantry. (July 1957): 21-26.
- , "Pentomic Company in the Attack." Infantry. (October 1957): 68-75.
- Killebrew, Robert. "NATO, Deterrence, and Light Divisions." Military Review. (May 1985): 2-15.
- Kirkpatrick, Jeanne. "Beyond the Cold War." Foreign Affairs. (Winter 1990): 1-16.
- Larkins, S.F. "Mobility for Infantry Engaged in Low Level Operations." Defense Force Journal. (March-April 1989): 56-62.
- Lind, William. "Light Infantry: A Response." Marine Corps Gazette. (January 1991): 52-53.
- Luttwak, Edward. "Light Infantry: The Army's Most Important Initiative?" Armed Forces Journal International. (May 1987): 8.
- Machmud, Benjamin. "Weasel Increases Defensive Power and Versatility of Airborne Division." Asian Defense Journal. (November 1991): 68
- Mazarr, Michael. "Middleweight Forces for Contingency Operations." Military Review (August 1991): 32-39.
- McMichael, Scott. "Proverbs of the Light Infantry." Military Review. (September 1985): 22-28.
- Menser, Michael. "Light Infantry in Change." Military Review. (December 1987): 53-57.
- Meuller, Paul Jr. "Ride to Work." Infantry. (October 1957): 56-67

- Molan, A.J. "Prospect for Infantry." Defense Force Journal. (March/April 1987): 19-33.
- O'Meara, Andrew. "Dimensions of Mobility." Armor. (January-February 1982): 23-25.
- Olson, William. "The Light Force Initiative." Military Review. (June 1985): 3-17.
- Pullman, Milton. "Administration in the Pentomic Infantry Division." Military Review. (January 1958): 31-39.
- Record, Jeffrey. "The US Army in the Post-Cold War Era." Strategy Review. (Summer 1991): 75-81.
- Reid, Brian. "J.F.C. Fuller's Theory of Mechanized Warfare." Strategic Studies. (December 1978): .
- Rozman, Thomas. "Thoughts on Medium or Motorized Forces." Infantry. (January-February 1991): 22-26.
- . "Making Light Forces More Flexible and Responsive." Armor. (January-February 1991): 18-20.
- Russo, Vincent. "Army Perspectives on Strategic Mobility." Defense Transportation Journal. (August 1985): 14.
- Schemmer, Benjamin. "Army Planning Revealed at Its Worst in Testimony on Its Modernization Plan?" Armed Forces Journal International. (April 1987): 14-20.
- . "Army Planning Revealed at Its Worst in Testimony on Its Modernization Plan?" Armed Forces Journal International. (April 1987): 14-20.
- Schneider, James. "The Theory of the Empty Battlefield." RUSI: Journal of the Royal United Services Institute for Defense Studies. (September 1987): 37-43.
- Segal, David. "Army Light Infantry Divisions: Are They Fit to Fight?" Armed Forces Journal International. (October 1988): 82-88.
- Seifert, Albert. "This Show is Not Rigged." Infantry. (June-July 1960): 68-70.
- Simpson, Edward. "A New Lift for the Infantryman." Infantry. (July-September 1958): 31-34.

- Sorensen, Theodore. "Rethinking National Security." Foreign Affairs. (Summer 1990): 1-17.
- Stamey, Roderick Jr. "Mobile Infantry?" Infantry. (July 1953): 64-72.
- , "Firepower and Speed will Beat the Odds." Infantry. (April 1956): 53-59.
- Stewart, William. "Interaction of Firepower, Mobility and Dispersion." Military Review. (March 1960): 26-33.
- "The 1958 World-wide Infantry Conference: A Report to Infantrymen." Infantry. (January-March 1959): 6-15.
- Tiffany, Allen. "Light Infantry Divisions with More for the Fight." Military Review. (August 1991): 40-55.
- Tosh, Vernie and James Hobson. "Mobility: Pentomic Infantry Division." Infantry. (July 1957): 35-39.
- Velocci, Tony. "The New Light Division: Will it Work?" National Defense. (November 1984) p. 56-60.
- Vuono, Carl. "The United States Army is a Strategic Force." Armed Forces Journal International. (February 1989): 60-64.
- Wass de Czege, Huba. "Three Kinds of Infantry." Infantry. (July-August 1985): 11-13.
- "Why Five? Part I: Infantry Division." Infantry. (April, 1957): 6-12.
- "Why Five? Part II: Infantry Division." Infantry. (July 1957): 6-10.
- "Why Five? Part III: Infantry Division." Infantry. (October 1957): 6-8.
- Wyly, Michael. "Significance of Light Infantry." Marine Corps Gazette. (January 1991): 53-55.

GOVERNMENT PUBLICATIONS, DOCUMENTS, AND STUDIES

- Department of Defense. MTMCTEA Reference 92-700-2, Logistics Handbook for Strategic Mobility Planning. Newport News, Virginia: Military Traffic Management Command Transportation Engineering Agency, September 1992.
- Foreign Military Studies Office. "Future Threats and Challenges". Foreign Military Studies Office Issue Paper No. 3. (Fort Leavenworth: Combined Arms Command, 6 November 1991.

Hassell, Timothy. Army of Excellence, Final Report, Volume II: The Light Infantry Division. Fort Leavenworth, Kansas: US Army Combined Arms Combat Development Activity, 29 June 1984.

Herbert, Paul. Deciding What Has to Be Done: General William E. Deputy and the 1976 Edition of FM 100-5, Operations, Leavenworth Papers No. 16. Fort Leavenworth: Combat Studies Institute, July 1988.

House, Jonathan. Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization, Research Survey No. 2. Fort Leavenworth, Kansas: Combat Studies Institute, US Army Command and General Staff College, August 1984.

McMichael, Scott. Light Infantry Forces, Historical Bibliography No. 2. Fort Leavenworth, Kansas: Combat Studies Institute, US Army Command and General Staff College, January 1984.

----- A Historical Perspective on Light Infantry, Research Survey No. 6. Fort Leavenworth, Kansas: Combat Studies Institute, US Army Command and General Staff College, September 1987.

Meyer, Edward. White Paper 1980: A Framework for Molding the Army of the 1980's into a Disciplined, Well Trained Fighting Force. Washington, DC: Department of the Army, 1980.

Romjue, John L. A History of Army 86: The Development of the Light Division, the Corps, and Echelons Above the Corps. Fort Monroe, VA: HQ, US Army TRADOC, December, 1981.

US Air Force. Air Force Regulation 76-2, Airlift Planning Factors. Washington DC: Department of the Air Force, 29 May 1987

US Army. Data Book: M113 Family of Vehicles. Warren, Michigan: Tank-Automotive Command, April 1992

----- Field Circular 71-101, Light Infantry Operations. Fort Leavenworth, Kansas: US Army Combined Arms Center, June 1984.

----- FM 100-20, Military Operations in Low-intensity Conflict. Washington, DC: Department of the Army, 5 December 1990.

----- FM 71-100, Division Operations. Washington, DC: Department of the Army, June 1990.

- Training and Doctrine Command Pamphlet 11-9: Blueprint of the Battlefield. Fort Monroe, Virginia: HQ US Army TRADOC, 15 February 1991.
 - Training and Doctrine Command Regulation No. 11-15, Army Programs, Concept Based Requirements System. Fort Monroe, Virginia: HQ US Army TRADOC, 4 August 1986.
 - "FM 100-5, Operations (Preliminary Draft)". Washington, DC: Department of the Army, 21 August 1992.
 - "M113/M60 Family of Vehicles (Briefing Slides)". Warren, Michigan: Tank-Automotive Command, January 1992.
 - "M2/M3 Bradley Claimants (Briefing Slides)." Fort Leavenworth: US Army Combined Arms Command, Combat Developments, February 1992. REQ FY 95.
 - Battle Book: US BDE/BN Task Force, Tactical Commanders Development Course. Fort Leavenworth, Kansas: Command and General Staff College, 1991.
 - FM 100-5, Operations. Washington, DC: Department of the Army, 5 May 1986.
 - Student Text 100-1, Navy and Marine Corps. Fort Leavenworth, Kansas: Command and General Staff College, 30 June 1991.
 - Student Text 101-6, G1/G4 Battle Book. Fort Leavenworth, Kansas: Command and General Staff College, 1 June 1991.
- Wickham, John. White Paper 1984: Light Infantry Divisions. Washington, D.C.: Department of the Army, 16 April 1984.

UNPUBLISHED DISSERTATIONS, THESES, AND PAPERS

- Caldwell, William. "Not Light Enough to Get There, Not Heavy Enough to Win: The Case of US Light Infantry." Monograph, US Army School of Advanced Military Studies, 4 December 1987.
- Carmichael, John. "Maintaining Mobility on a High Tech Battlefield." Monograph, US Army School of Advanced Military Studies, 15 May 1989.

- Elam, Richard. "The Soviet BTR on the Modern European Battlefield: Does It Have a Place in the US Army's Light Infantry?" Monograph, US Army School of Advanced Military Studies, 26 March 1990.
- Finehout, Arthur. "The Contingency Army: Structured for Success?" Monograph, US Army School of Advanced Military Studies, 9 May 1991.
- Ghee, Su Poon. "Equipping the Infantry Division (Light) in the 1990's." Master of Military Art and Science Thesis, US Army Command and General Staff College, 1986.
- Godwin, William III. "The Operational Employment of the Light Infantry Division." Master of Military Art and Science Thesis, US Army Command and General Staff College, 1986.
- Harkins, Gerald. "Formation of the Light Infantry." Individual Study Project, US Army War College, 21 March 1986.
- Harned, Glenn. "The Principles of Tactical Organization and their Impact on Force Design in the US Army." Monograph, US Army School of Advanced Military Studies, 2 December 1985.
- Jacoby, Charles. "Light Infantry in AirLand Battle Future: Organizing for Success." Monograph, US Army School of Advanced Military Studies, 9 April 1991.
- Marchant, Richard. "Are Motorized Infantry Forces Essential to the United States Army?" Monograph, US Army School of Advanced Military Studies, 12 January 1989.
- McMichael, Scott. "Discussions on Training and Employing Light Infantry." Fort Leavenworth, Kansas: Combat Studies Institute, Report No. 8., US Army Command and General Staff College, 5 July 1984.
- O'Brien, John. "Size 12 Leather Personnel Carriers: Tactical Mobility and the Light Infantry." Monograph, US Army School of Advanced Military Studies, 31 December 1990.
- Poston, David. "Light Infantry Augmentation to Heavy Divisional Forces in Europe: A European Heavy-Light Primer." Master of Military Art and Science Thesis, US Army Command and General Staff College, 1989

- Reese, Robert. "Operational Considerations for the Employment of a Light Infantry Division in a Contingency Scenario." Monograph, US Army School of Advanced Military Studies, 21 May 1987.
- Schroedel, Joseph. "The Art and Science of Operational Maneuver." Monograph, US Army School of Advanced Military Studies, 1988.
- Swan, Robin. "The AirLand Battle Future Heavy Brigade and Low-Intensity Conflict Contingency Operations." Monograph, US Army School of Advanced Military Studies, 13 December 1990.
- Tomlin, Harry. "Organizational Design of Light Forces: A Structure for All Seasons." Monograph, US Army School of Advanced Military Studies, 29 November 1988.
- Van Drie, Mark. "A Light Infantry Division for AirLand Battle-Future." Monograph, US Army School of Advanced Military Studies, 26 March 1990.
- Wass de Czege, Huba. "Understanding and Developing Combat Power." Fort Leavenworth, Kansas: US Army School of Advanced Military Studies, 10 February 1984.