ADDING THUNDER TO THE LIGHTENING - GREATER FIREPOWER FOR THE LIGHT ARMORED INFANTRY BATTALION

A Monograph
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First Term AY 89-90

UNCLASSIFIED
URITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited
). DECLASSIFICATION / DOWNGRADING SCHEDULE	
PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
a. NAME OF PERFORMING ORGANIZATION School of Advanced Military Studies, USAC&GSC 6b. OFFICE SYMBOL (If applicable) ATZL-SWV	7a. NAME OF MONITORING ORGANIZATION
c. ADDRESS (City, State, and ZIP Code) Fort Leavenworth, Kansas 66027-6900	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) Adding Thunder to the Lightning - Greater Firepower for the Light Armored Infantry Battalion (U)	
12. PERSONAL AUTHOR(S) MAJ John R. Priddy, USMC	
13a. TYPE OF REPORT Monograph 13b. TIME COVERED FROM _____ TO _____ 14. DATE OF REPORT (Year, Month, Day) 15. PAGE COUNT 50	
16. SUPPLEMENTARY NOTATION	
17. COSATI CODES FIELD / GROUP / SUB-GROUP	18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) light armored infantry battalion field artillery tactical missions (continued on other side of form)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Introduction of Light Armored Infantry (LAI) Battalions has presented a dilemma for the Marine Corps' field artillery organization. Intended to furnish a force commander with a self-contained maneuver unit for conducting classic cavalry missions of reconnaissance, security and limited offensive operations, these battalions are composed of wheeled armored vehicles configured to provide a variety of capabilities. Developed to permit independent activities beyond the protection of the main force, these units depend for survival upon the speed and mobility inherent in their vehicles. However, with respect to their security and offensive roles, organic firepower systems are inadequate to enable LAI battalions to achieve their full combat potential. Further, adequate procedures do not exist to provide artillery support which may prove critical to the battalion's mission accomplishment.

This study examines alternatives available to meet the LAI battalions' firepower
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20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL MAJ John R. Priddy	22b. TELEPHONE (Include Area Code) (913) 684-2138 22c. OFFICE SYMBOL ATZL-SWV

DD Form 1473, JUN 86 *Previous editions are obsolete.*

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

Item 18 cont.
field artillery roles
field artillery support fundamentals
Soviet tactical doctrine
smart munitions

Item 19 cont.
problem. It first explores the organizations, characteristics and concepts of employment for the LAI battalion and for field artillery, and shows that the current field artillery organization is incapable of delivering responsive support through standard tactical missions. Next, historical examples of providing close artillery support to organizations beyond the range of main force assets are described and analyzed to determine possible alternatives. Characteristics and vulnerabilities of threat offensive doctrine, as well as limitations to available systems and compensating technological advances are reviewed to determine firepower requirements.

The study concludes that enhanced firepower may best be provided to the LAI battalion through upgrading its current organic mortars with 120mm systems and with available "smart" munitions. This solution provides an "artillery equivalent" capability in terms of lethality, a subunit light enough to complement the speed and mobility characteristics of the supported force, and an organic relationship for optimal responsiveness and command and control. Together, these benefits would enable LAI battalions to best match firepower with mobility to effectively meet mission requirements and would permit retention of limited field artillery assets for the higher commander to better influence his main battle operations with a mass fire capability.

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

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Title of Monograph: Adding Thunder to the Lightning - Greater Firepower for the Light Armored Infantry Battalion

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Accepted this 26th day of March 1990.

ABSTRACT

ADDING THUNDER TO THE LIGHTNING: GREATER FIREPOWER FOR THE LIGHT ARMORED INFANTRY BATTALION, by Major John R. Priddy, USMC, 50 pages.

Introduction of Light Armored Infantry (LAI) Battalions has presented a dilemma for the Marine Corps' field artillery organization. Intended to furnish a force commander with a self-contained maneuver unit for conducting classic cavalry missions of reconnaissance, security and limited offensive operations, these battalions are composed of wheeled armored vehicles configured to provide a variety of capabilities. Developed to permit independent activities beyond the protection of the main force, these units depend for survival upon the speed and mobility inherent in their vehicles. However, with respect to their security and offensive roles, organic firepower systems are inadequate to enable LAI battalions to achieve their full combat potential. Further, adequate procedures do not exist to provide artillery support which may prove critical to the battalion's mission accomplishment.

This study examines alternatives available to meet the LAI battalions' firepower problem. It first explores the organizations, characteristics and concepts of employment for the LAI battalion and for field artillery, and shows that the current field artillery organization is incapable of delivering responsive support through standard tactical missions. Next, historical examples of providing close artillery support to organizations beyond the range of main force assets are described and analyzed to determine possible alternatives. Characteristics and vulnerabilities of threat offensive doctrine, as well as limitations to available systems and compensating technological advances are reviewed to determine firepower requirements.

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Introduction

Light Armored Infantry (LAI) battalions are distinctive commands within the Marine Corps' ground combat organization. Unlike other Marine ground maneuver forces, they are not task-organized to accomplish specific, situationally-dependent missions, but are configured with an organic mix of combat and combat support assets. Designed around a family of wheeled combat vehicles, LAI battalions are tasked to conduct classic cavalry missions of reconnaissance and security, previously undertaken by light foot and HMMWV-mobile forces, often augmented by a sparse allocation of tanks. Additionally, they may be tasked to conduct offensive activities to assist the force commander to shape the battlefield.

The battalion's success and survivability depend on its speed, mobility and the firepower inherent to a variety of incorporated weapons systems. However, LAI doctrine has recognized and cited the limited lethality of its organic weapons as one of the battalion's two principal vulnerabilities (the other being its minimal armor).(1) This restriction on combat capabilities has been further confirmed by commanders in the field(2), and current doctrine developers(3), who have cited the unit's need for either more responsive artillery or improved organic capabilities. While employment concepts envision operations well beyond the main force's protective artillery umbrella, no procedural or force structure changes have been forthcoming to provide the additional fire support critical to accomplishing the battalion's security and offensive missions.

Doctrinally, field artillery is allocated to all committed maneuver units. This has generally been met by assigning an artillery battalion in direct support of an infantry regiment. In the Marine Corps, this relationship has been based on a division organization for combat that reflected three infantry regiments as the only semi-autonomous ground maneuver commands. The fairly recent introduction of the division's tank battalion as another maneuver unit, and the subsequent addition of the LAI battalion, have overtaxed the division's artillery resources. Almost concurrently, force structure changes have reduced these assets, leaving the division's artillery regiment with only four battalions to accomplish all fire support requirements. With the competing demands of infantry regiments and the tank battalion, the pertinent question still remains: Can greater firepower be provided to the LAI battalion for security and offensive operations?

This paper will examine the relationship of artillery support to the maneuver force main effort to determine the viability of alternate solutions to the LAI battalion's firepower problem. The organizations, characteristics and concepts of employment for the LAI battalion and artillery will be explored to better define the current support problem. Historical examples of fire support for ground maneuver units operating beyond the protection of main force assets will be described and analyzed to identify alternatives to current doctrinal methods of artillery support. The environment of the future battlefield, including the potential threat and its perceived vulnerabilities; the limitations of current support systems; and technological advances pertinent to system enhancement;

will be examined to determine what support is necessary to complement security and offensive mission requirements. The monograph will conclude with a proposed solution and will outline resulting implications for future doctrine and force structure.

The Light Armored Infantry Battalion

The Iran Hostage crisis of 1978-80 resulted in the establishment of the U.S. Rapid Deployment Joint Task Force and the subsequent realization that the Marine Corps lacked the firepower, tactical mobility and survivability of mechanized forces of potential enemies in the Southwest Asia/Persian Gulf regions, as well as those of the Warsaw Pact.(4) Indeed, the rapid increase around the world in mechanized forces demonstrated that there were few places where an amphibious landing would be unlikely to meet with a mechanized combined arms threat.(5) Consequently, both the Department of Defense and Congress concurrently established programs to study the feasibility of creating light armored vehicle units to be predicated upon access to "off-the-shelf" systems and a versatile variety of weapons systems combinations. In 1984, following concept development and initial purchases of equipment, the Marine Corps activated the first of three Light Armored Infantry Battalions.

Each unit is structured similar to a Marine infantry battalion. A headquarters and services company provides the means for command and control and service support, which includes maintenance, motor transport and medical activities. Functional staff sections are located within the headquarters element to support planning and

coordination. Combat power is generated through three light armored infantry companies, each consisting of 15 combat vehicles, and an organic weapons company. The latter includes a medium mortar platoon and an antitank platoon. Of particular note is the weapons company's responsibility to operate the battalion's fire support coordination center. The weapons company commander is also the fire support coordinator and, when provided with liaison personnel, is capable of planning, coordinating and integrating close air support, artillery, naval gunfire and mortar fires to support the battalion's maneuver.(6)

Speed, mobility and combat versatility are provided by six variants of the Swiss-Canadian-made PIRANHA 8-wheeled combat vehicle. These vehicles are capable of attaining speeds up to 50 miles per hour with an accompanying range of 400 miles on partially improved roads. Off-road, the battalion can climb 60 degree slopes, and can operate on 30 degree slopes. All variants can cross bridges that would buckle under a tank and, if necessary, all can swim.(7) In addition to command and control, logistics support and equipment recovery variants, three integrated weapons systems are included. The principal PIRANHA variant, the LAV-25, is capable of transporting 4 combat-equipped Marines in addition to its 3-man crew, and is armed with an M242 25mm chaingun. The LAV-M, mortar carrier, provides the battalion's only organic indirect fire asset, a M252 81mm mortar capable of being fired either internally or externally by its 3-man crew. The mortar has a range capability of 5675 meters, and its destructive ammunition mix is primarily designed for fragmentation effects against dismounted and exposed

infantry forces. An antiarmor capability is provided by the LAV-AT, which is armed with an M91, two-missile TOW II launcher, and may be loaded and fired from defilade positions without exposing the crew to hostile fire.(8)

The battalion's concept of employment roughly equates to that of armored cavalry, and includes reconnaissance, security and limited offensive operations. Thus, it is tasked to undertake activities to allow the commander to see the battlefield and provide him with space and time to maneuver against enemy vulnerabilities.(9) While its reconnaissance role is within the capabilities of its organic firepower and mobility capabilities, the battalion's security and offensive-oriented missions warrant closer review. Security operations, principally the location, harassment and delay of the enemy, would support the buildup of combat power ashore, including preparation for expanding the beachhead and conducting subsequent offensive operations. Offensive activities envisioned would strike against enemy vulnerabilities, create confusion and destroy key installations.(10) Both missions would present the battalion with potential confrontation by an armored and/or mechanized enemy and would require employment beyond the protection of the main force's artillery umbrella. Consequently, unless augmented with additional artillery support, adequate disruption of the enemy's operational preparations and movements would exceed the destructive capabilities of the LAI battalion.

Thus, despite advantages of speed and mobility, the battalion is severely constrained by limitations of its available organic firepower. The 25mm cannon and 81mm mortars are insufficient to

enable the battalion to effectively operate against mechanized and armored forces. Further, artillery organization and doctrine do not provide the means and methods for responsive indirect fire support. Currently, artillery support is limited to fires based on priorities for the force as a whole, and is then only available when the unit is operating within the main body's protective umbrella. Target acquisition is currently restricted to the battalion's own imagination and limited assets; observers are not available from the artillery organizational structure, but are improvised through the ad hoc use of cross-trained infantrymen.(11) Together with its own firepower deficiencies, these limitations call into question the battalion's ability to conduct security and economy of force offensive operations on the modern battlefield. To better define the nature of this problem, a closer examination of artillery doctrine and structure is required.

Field Artillery Support

The mission of field artillery is to destroy, neutralize or suppress the enemy by fires, and to help integrate all fire support assets into combined arms operations.(12) To meet these requirements, field artillery support is organized and equipped to accomplish three fires support functions or "roles:" close support to maneuver forces, counterfires and interdiction. In both attack and defense, these fires serve to neutralize, canalize and destroy the enemy's formations; to limit the enemy's observation and impede his ability to acquire and attack friendly forces; and to permit the

engagement and destruction of targets deep in the enemy's rear area.(13)

These artillery roles present different priorities for the field artillery system, and their successful execution requires a balance between speed of responsiveness and the adequate massing of assets. The ability of the field artillery system to deliver both responsive and concentrated fires is provided through its organization for combat. Command and control relationships are established to ensure that artillery fires are timely and adequate to support the operation. Thus, each field artillery unit is assigned a tactical mission of direct support (DS), reinforcing (R), general support/reinforcing (GSR) or general support (GS).(14) (See Appendix A for inherent responsibilities of field artillery missions.) Of particular importance to ground maneuver units is the direct support relationship. Under this mission, fires are dedicated, planned and coordinated to meet the needs of a specific maneuver command, liaison and observer personnel and equipment are furnished, and the DS battalion is positioned to best sustain the supported unit's scheme of maneuver.(15)

Field artillery is organized based on five principles or "fundamentals." These principles are as follows: provide adequate support for committed combat units, weight the main attack or the most vulnerable defended area, facilitate future operations, insure immediate availability of artillery support, and provide maximum centralized control.(16) The field artillery organization within the Marine Corps reflects adherence to these fundamentals, but lacks the flexibility to meet current trends in the Corps' evolving force

structure, employment doctrine, and the demands of the modern battlefield. Each of the three active divisions includes a field artillery regiment within its organic combat support forces. Despite subtle differences in numbers and systems between these units, artillery regiments contain three battalions of towed howitzers, each assigned a tactical mission of direct support to one of the division's three infantry regiments. The artillery regiment also includes a battalion of howitzers assigned a tactical mission of general support for the division. Previously, each artillery regiment also contained a fifth battalion; however, these have been deleted from the active structure and relegated to the reserve force. Given this structural background, a comparative review of the fundamentals of artillery organization and the above artillery force structure should assist in defining the characteristics of the LAI battalion's artillery support problem.

Adequate support for committed units is generally met by providing an artillery battalion in direct support of an infantry regiment. This is the most decentralized of the tactical missions and provides the most immediately responsive fires. However, current doctrine also presupposes that an infantry regiment will be the smallest maneuver unit requiring a formal support relationship with an artillery unit. The Marine artillery force structure was created to provide support for the three traditional infantry regiments organic to the division. This arrangement served well until the early 1980's when, adhering to tenets of the emerging theory of maneuver warfare, the division's organic tank battalion began to be utilized as a separate maneuver force. Introduction of

the LAI battalion in 1984 further exacerbated the problem. Field artillery support to these units. when provided, has been accomplished by assigning priority of fires from the general support battalion.

The weighting of combat power to the main attack or most vulnerable defensive area is usually accomplished through the augmentation of a direct support battalion's fires with those of another artillery unit assigned reinforcing or general support/reinforcing missions, by careful positioning and mutually supporting directions of fire, and by additional allocations of ammunition. Given the increasing tendency towards more rapid and mobile warfare, the towed artillery systems predominant within the existing force structure may prove ill-suited to a high-paced, cross-country battlefield environment.(17) Additionally, recent reductions in the field artillery force structure contrast sharply with the preponderance of assets depended upon during and since World War II. Therefore, it is highly questionable whether the existing artillery organization for combat can provide the "weight" necessary to favorably influence offensive or defensive actions, much less meet the needs of an independent, forward maneuver force such as the LAI battalion.

The ability to facilitate future operations requires flexibility to meet unforeseen events and to change rapidly from one phase of an operation to another. Previously, this principle was met through assignment of standard tactical missions and their modification to meet anticipated requirements; assignment of on-order missions; and the redistribution of ammunition.(18)

Nonetheless, as with previous observations, the reduced number of weapons within the artillery organization for combat, and the additional demands for support, leave little flexibility for creative realignment of resources. Further, the principle of immediately available support for the commander to influence the action is also constrained by this lack of systems density.

Centralized control has offered the commander the greatest degree of responsiveness to alter the application of limited fire support assets. Generally less centralized control has been preferred in the offense, when the supported force enjoys the initiative, versus in the defense to counter the enemy's like advantage.(19) Maneuver warfare theory minimizes the value of centralized control to achieve more responsive fires that can accompany more dispersed supported forces.(20) However, the limited mobility of towed artillery systems as well as the reduction in their numbers justify retention of centralized control to permit the commander the greatest potential for generating combat power. This retention greatly inhibits the current artillery organization in its support of additional maneuver units such as the LAI battalion.

Through examination of the mission, structure and employment concepts of the LAI battalion and the field artillery, the problem is more discernible. The LAI battalion requires greater firepower than is available with existing organic systems to accomplish its security and independent offensive missions. Its survivability is provided by the battalion's inherent speed and mobility. Existing doctrine, LAI battalion commanders and future doctrine developers concur that more lethal and responsive systems are needed to permit

engagement of deep targets of opportunity, beyond the supportive artillery umbrella of the main force. They are also necessary to enable the battalion to effectively conduct delaying operations against an attacking enemy. These requirements conflict with both the current structural design of the field artillery organization and the continuing necessity of concentration and centralized control. For the force commander to realize the full potential of the LAI battalion, and to achieve a synergistic effect from all his available combat capabilities, adequate firepower must be available to meet both needs.

Clausewitz states that because of the nature of the art of war, one needs the experience factor of historical example rather than the pure empirical data of science.(21) Thus, at this point it is appropriate to examine some historical examples of how adequate, flexible and responsive fire support was provided to maneuver units operating, either in time or space, beyond the immediate support of their more powerful parent force. In each example, these three requirements were met by methods of decentralizing control of artillery assets to meet the demands of the supported unit's speed, mobility and isolation from other supporting forces. Although the units examined are not necessarily similar to the LAI battalion in mission or organization, their characteristics of employment are comparable and add relevance to their review.

Matching Firepower with Maneuver

Since the First World War, the requirement for immediately

responsive firepower to support mobile forces has proven increasingly critical. During that conflict, artillery employment retained a conservatism that combined with technological and environmental constraints to preclude responsive fires to supported units. Doctrinally, artillery fires were believed most efficient when concentrated in overwhelming barrages under strict centralized planning and control. Further, the poor capabilities of contemporary communications prohibited reliable unplanned fires. Finally, the equally rudimentary means of available transportation, and the natural and man-made impediments of the battlefield restricted the artillery's ability to follow in trace of advancing units. Efforts to correct these deficiencies were undertaken before and during World War II by all principal belligerents. Of particular relevance are the evolutionary efforts by Germany and the United States.

The Spanish Civil War provided the German Army with a testbed for developing new tactics to complement modern mobile warfare. Directed by the leader of the German military mission in Spain, General von Faupel, these tactics recognized the potential of forces to move independently, concentrate rapidly and achieve breakthroughs for exploitation.(22) The lessons from the Spanish experience also identified the requirement for immediate artillery support, and led to a reappraisal of artillery organization and doctrine.

Doctrine previously stressed mass and flexibility through centralized control at the division level. However, the Spanish experience indicated a need for a degree of immediate support that required a more decentralized approach. This reflected a belief of

mobile warfare proponents that artillery would no longer be overloaded with a weight of bombardment over considerable areas, but would mainly provide rapid action against targets which had not been known to exist before the action started.(23)

The main mission of artillery would be to deal with isolated points of resistance against the supported maneuver force, and against moving targets; neither of which required centralized, mass fires. Although decentralization would make concentration and coordination of several units more difficult, it was believed that such effects would usually be possible, even if by only two or three batteries. Also, decentralized artillery had proven more successful in covering dead ground, where observation would be difficult for more centralized units, and in situations where communications between observers and gun positions would be impaired.(24)

Artillery at the division level was divided into brigade artillery, termed "nahkampfartillerie", for close support, and divisional artillery, called both "fernkampfartillerie" and "schwerpunktartillerie." Brigade artillery would usually be temporarily distributed among different task-organized combat teams, and used speed of movement and employment to provide rapid suppression before withdrawing to cover. Division artillery's principal role was to fill any gaps in the air bombardment, form the artillery thrust points, neutralize targets that required prolonged bombardment and, in case of counterattack, provide a base to its own combat teams.(25)

The Germans believed artillery support should be far enough forward to influence the battle at the decisive time and place.(26)

For immediate support, each infantry regiment was provided with its own organic artillery unit. Called an "infantrieshutzkompanie," it consisted of eight guns. Six of these guns were field pieces of 77mm, and the remaining were 155mm. The regimental commander would often further attach two gun sections to his separate battalions.(27)

More responsive support was also provided to German mountain units. These were tailored to fight independently, using agility, speed and initiative, and were focused on limited offensive operations. Difficulties in centralized fire support led to creation of 75mm howitzer platoons, called "hausbatterien," which were made organic to battalions and regiments in their light and heavy weapons companies. The former were composed of 75mm howitzers, while the latter were generally 105mm weapons.(28)

Both "infantrieschutzkompanie" and "hausbatterien" units proved extremely effective in accomplishing their intended task of reaponsive fires. The former provided superior support during the rapid advances across Poland, France and the Soviet Union, and the latter were significant factors in the success of German small unit defensive operations. "Hausbatterien" also proved particularly well suited to the constrained environment of mountain warfare. During operations in the Causausus in 1942, light, dispersed German units moved their organic artillery well forward with their advanced guard and were able to rapidly build up decisive combat power to support follow-on forces and support the subsequent attack.

Like the Germans, in 1942 the United States Army provided infantry regiments with an organic artillery capability. Designated

"cannon companies," these units were intended to provide close-in direct-fire support for ground troops, particularly in fast moving operations.(29) Adoption of these units resulted from a study of German "blitzkrieg" tactics and organization during the Polish campaign of 1939, and was supported by observations from the Louisiana, Tennessee and Carolina maneuvers of 1940 and 1941.

Cannon companies were improvised organizations. They included both 75mm and 105mm howitzers, mounted in M-3 halftracks, and were operated by infantrymen instead of regular artillerymen. These ad hoc cannoneers received no formal training, and learned to operate their weapons on hastily established ranges. Companies weren't organized with forward observers, but junior officers were eventually trained to meet this requirement.(30)

Despite their makeshift organization, cannon companies provided effective close support to infantry units in North Africa, Sicily and on the mainland of Europe. Additionally, deficiencies identified in North Africa initiated changes which greatly improved the quality of supporting fires for infantrymen in subsequent campaigns. The principal lesson from North Africa was the need for comprehensive training in indirect-fire procedures, which had proven more essential to the infantry's success than the originally conceived direct-fire requirement.(31) Throughout the remainder of the war, cannon companies earned and enjoyed a good reputation with their supported infantry units.

The General Officer Review Boards, which met in 1945 and 1946 to examine divisional organizations, validated the cannon company's utility as a means to provide immediate fire support. The board

also recognized and documented the unit's responsiveness over divisional artillery when communications were lost with the later. However, in 1947 the Army dropped the cannon company from the table of organization and equipment for infantry regiments. They were not disbanded for lack of need, but apparently due to drastic force reductions.(32) By the Korean War, lack of cannon companies and a shortage of required artillery, resulted in increasing substitution of 4.2 inch (107mm) mortars for indirect fire support.(33)

The Vietnam War saw the first large scale use of helicopters to transport troops, artillery and supplies. Helicopters added a new dimension to the battlefield by providing a commander a more responsive and flexible means to concentrate his combat power where it was needed. Tactical operations were predominantly offensive in nature and focused on "finding, fixing, and destroying the enemy."(34) Units were scattered widely in order to control large areas; consequently, the battlefield was non-linear and multi-directional. Although there were a number of large unit operations, tactical activities were mostly conducted by light maneuver forces composed of brigades, battalions and companies. Every infantry unit in Vietnam became, in fact if not in name, air mobile, and its direct support artillery became airmobile artillery.(35)

The increasing maneuverability of units, and the decentralized nature of combat led to modification of established artillery operating doctrine. To meet the new demands of responsive fire support, it became necessary to attach a "direct support" battery to each infantry battalion. Due to the wide dispersal of units, these

batteries were usually isolated from their parent battalions, and assumed a relatively permanent "habitual association" with the supported infantry unit.(36)

Transported by helicopters, artillery proved as mobile as maneuver forces, and could be rapidly inserted into positions for delivery of fires to support an attack and subsequent consolidation of forces. Aerial displacement eliminated the effects of ground obstacles, such as congested roads, blown bridges and insecure routes, which hampered movement by conventional transportation. By rapidly displacing over obstacles and moving to any secured point on the battlefield, airmobile artillery batteries provided almost unparalleled responsiveness to supported units and came to possess a practically unlimited engagement range.(37)

The effectiveness of "attached" airmobile artillery was well proven during the Ia Drang (Pleiku) campaign, from 23 October to 18 November 1965. Conducted by the 1st Cavalry Division, these operations saw the first air deployment and supply of cannon artillery in an area of extremely rugged terrain. During the campaign, batteries conducted 67 of 79 displacements by air, each of which required an average of 12 CH-47 sorties.(38)

Although air mobility and "attached" batteries greatly improved firepower responsiveness and limited mobility-related degradations in support, these capabilities were not without their own special requirements; nor were they conducted without problems and costs. To permit attachment of batteries to the maneuver battalion level, greater artillery assets were required to support the force as a whole. Thus, the overall field artillery force in Vietnam grew to

provide traditional fire support missions in addition to the batteries attached to maneuver battalions. In fact, Marine artillery regiments in Vietnam almost doubled in strength to meet demands for support.(39) Also, air mobility presented additional requirements and constraints. Air transportation rigging, and the availability of associated ground personnel, proved time consuming and thus demanded a dedication of resources to ensure necessary responsiveness. Airmobile artillery operations were not possible at night or during certain weather conditions due to visibility and limitations of navigation with external loads. Additionally, once delivered, weapons were tied to their location until recovered for subsequent positioning by available aircraft. Even in Vietnam, availability was not always predictable due to attrition of air resources from an increasingly sophisticated enemy ground threat. Consequently, while increasing firepower responsiveness, airmobile artillery put a considerable strain on air resources, with a resulting degradation in helicopter support for other requirements.

Germany and the United States still recognize the continuing need for specific indirect weapons assets to accompany and support semi-independent or separated maneuver units. Both have retained a distinct method to meet this requirement. The most unique is Germany, which has continued the practice of providing organic close support systems to its mountain units. Not unlike the "hausbatterien" of World War II, each mountain force includes a battery of 120mm mortars.(40) These have proven adequate to meet the requirements for mobility and lethality better than comparable cannon artillery systems. Further, their high angle of fire is

particularly effective in the close confines of their intended employment areas.

Not too dissimilar from the cannon companies of World War II, the United States Army has retained a 155mm self-propelled battery organic to squadrons of armored cavalry regiments. Unique within the Army, this artillery reflects the semi-independent operating characteristics of the parent unit, and its requirement for immediately responsive supporting fires. Squadrons are employed to conduct reconnaissance, security missions and offensive or defensive combat missions. They will usually operate well beyond the range of expedient mutual support but, unlike the LAI battalion, must be strong enough to engage and survive decisive combat.(41)

In addition to howitzers, armored cavalry squadrons include 41 M-1 tanks, 38 M-3 cavalry fighting vehicles and 6 107mm mortars. Thus, with its variety of integrated and lethal firepower, the squadron can attack separately or be augmented by additional maneuver forces, and can be used for exploitation and pursuit missions. In the defense, with its combined arms organization, it is also particularly suited as an economy of force element to delay over extended frontages, defend secondary avenues of approach, or fight from battle positions as part of its parent regiment.(42) Although their mission concepts are similar, it is this density of combat power, and the resulting ability to become decisively engaged and conduct exploitation and pursuit operations, that most distinguishes the armored cavalry squadron from the LAI battalion.

A review of these historic solutions to responsive fire support requirements identifies several considerations relevant to enhancing

the LAI battalion's capabilities. The increasing pace of battlefield operations and the greater mobility of maneuver units since World War I demands immediately responsive fires beyond the capability of traditional field artillery organizations and doctrinal fire support relationships. Closely related to this lack of immediate response has been the disparity in mobility between major field artillery organizations and maneuver commands. Finally, in providing responsiveness, the cited solutions have reflected assets tailored for adequate fires, but small enough to avoid forcing unnecessary logistics, manpower and transportation burdens on the supported unit.

Maneuver units operating on a rapid paced and ever expanding battlefield require immediately responsive fire support. Although standard field artillery support relationships are provided by current doctrine, history in this century has proven that the need to concentrate fires through centralized planning, coordination and control will often limit the timely response of fires to maneuver commands. The need for massed fires on the modern battlefield cannot be discounted; however, Germany and the United States recognize the deficiency in responsiveness and have adopted special fire support units or techniques to meet this requirement, but do not degrade the established field artillery organization. In both countries today, special units and relationships are still maintained to ensure immediate firepower to ground maneuver units which operate dispersed and beyond protection of the main force.

Responsive fires require assets which are as mobile as the units they support. Despite the demand for concentration and the

resulting centralized coordination and control of location and movement, the relative mobility of artillery assets to that of modern maneuver units has proven a major hindrance to adequate support. Indeed, in each example, mobility exercised a significant influence over the type of artillery support provided. Thus, light weapons, although of more limited lethality, were selected and adapted to move as an element of the maneuver force. Of particular note are the cannon company of World War II, the airmobile artillery of Vietnam, and the German army's mountain mortars today. All illustrate successful innovation in existing technology to match firepower with mobility.

Artillery assets must be configured to provide adequate fires, but must not create a logistics and manpower burden on the supported unit. The size and composition of an added support element can negate its value if it too greatly expands the supported unit's logistics and manpower requirements. Artillery units are both materiel and manpower intensive. Both fuel and ammunition resupply may prove mission degrading, especially if they negate the firing unit's ability to match its supported unit's mobility. Additionally, artillery units possess little capability to provide their own protection. When threatened, firing units must either move or rely upon infantry augmentation for defense. The historical examples cited reflected an appreciation of these factors and, as with desired lethality, a compromise to accept smaller fire support elements which would operate in close proximity with the supported maneuver unit, and both provide and receive mutual protection. Consequently, batteries of four to eight weapons of light caliber

were commonly utilized. Smaller and less numerous weapons lessened the resupply burden and also permitted mobility commensurate with the infantry. The success of these innovative solutions illustrate the relevance of tailoring a firing element to enhance the operational capabilities of the supported maneuver unit.

If, as history suggests, a solution to the LAI battalion's fire support problem lies beyond standard doctrinal relationships, then what weapons should be provided to meet the support requirements of rapidly maneuvering forces, and how should they be configured? The answers must reflect the environment in which they will operate and the tasks they are intended to accomplish. Thus, it is important to analyze the most likely threat and assess potential vulnerabilities. To this analysis must be compared the security and offensive employment concepts of the LAI battalion. Additionally, the limitations of available weapons systems as well as the countering capabilities of modern technologies must be recognized.

Future Battle

The past employment focus of Marine combat forces has envisioned operations against poorly armed, trained and organized enemies. However, threat forces encountered on future battlefields will probably be well equipped, organized and employed similar to those of the Warsaw Pact. Even though the types of equipment, configuration and size of forces may differ from one area to another, the basic concepts of their structure and use should be fairly consistent. Based on Soviet operational and tactical

principles, these basic concepts provide for allocation of precise resources to create a carefully balanced combined arms force which includes armor, motorized or mechanized infantry, artillery, chemical defense, air defense and combat engineer units.(43) Specific composition would be tailored to existing battlefield conditions.

Soviet tactical doctrine is based on mass, momentum and continuous offensive action.(44) Thus, enemy commanders will seek to focus numerically superior forces against enemy weak points to achieve overwhelming tactical successes that will contribute to maintaining initiative and continuous forward movement. This momentum will be sustained by the echelonment of forces in depth. The first echelon force will be tasked to maintain contact with the enemy, locate weaknesses in defenses and rapidly create breaches to permit exploitation into enemy rear areas by the second echelon force. Soviets also emphasize swift, flexible and aggressive movement of combat power throughout the battlefield, and will accomplish this through rapid column movement in march formations.(45)

The Soviets believe the most important conditions for success in offensive operations are firm and uninterrupted command and control and the achievement of surprise.(46) The former is intended to permit the creation of an overwhelming concentration of combat power against an enemy's weakness at a predetermined point, while the latter would enable the commander to gain and retain the initiative. Adequate command and control is accomplished through the careful tailoring of units; specified routes, start lines, lines

of deployment and times of attack; and thoroughly understood battle drills. Following determination of force composition, it is echeloned in a march column to provide sequential commitment of combat power and maximum security during movement.(47) Surprise is sought through the use of heavily concentrated fires and the speed of the maneuver force. Fires are designed to cause severe losses among enemy troops and equipment, to disorganize command and control, to hamper the enemy's ability to gain the initiative and to delay reorganization and redeployment. Rapid movement of ground maneuver forces further hinders the enemy's ability to react, and supports the retention of momentum.

In accomplishing both prerequisites, careful sequencing, dispersion and employment of subordinate units by higher commanders leave little flexibility for junior leaders. Additionally, disruption at any echelon during the march will interfere with predetermined calculations and make it difficult for the commander to expediently compensate and attain his directed concentration. Together with predictable echelonment, dispersion and movement rates, the composition of march formations will offer lucrative targets for disruption.

Echelonment of forces will present several opportunities for interdiction by indirect fire systems. Limited artillery strikes carried out with surprise, speed and high intensity will leave an enemy in close march order with insufficient reaction time. Advancing at a march rate of 20-30 kilometers per hour during daylight and 15-20 kilometers per hour at night, an enemy force's reaction time will be restricted to 5-10 minutes during daylight and

12 - 15 minutes at night.(48) With a reduced availability of information when operating under radio listening silence, reaction time will be further diminished.(49) Thus, selective strikes can permit the attacker to introduce "movement friction" against an echeloned enemy and as a combat multiplier, to disrupt formations or force early, time consuming deployment.(50)

Soviet command and control is considerably vulnerable to surprise interdiction by indirect fires. Staffs are often overburdened by requirements from higher headquarters, which may cause inadequately prepared schemes of maneuver due to shortages of planning time.(51) Semi-independent operations, such as forward detachments, flank guards or advance guards may also be severely hindered by planning time, more so if interdiction requires unexpected deviations from a carefully calculated plan. In the attack, coordination becomes a most significant problem. Success depends on the synergistic effects of combined arms and on good timing. If artillery, smoke generators and air defense assets are not deployed at the right time and place, an attack is likely to fail in meeting its specified objective.

The task of putting together a combined arms attack against the time constraints of modern battlefield conditions is considerable and is likely to be aggravated by Soviet leadership tendencies. Tactical commanders tend to interfere with subordinates' commands, and foster a reluctance towards initiative and independent action. This results in a forwarding of problems up the chain of command and a time consuming delay for updated orders. Additionally, command and control nodes are predictably located and easily recognizable in march formations, which increases their vulnerability to attack.(52)

Engineer assets offer another lucrative vulnerability in the maintenance of Soviet offensive momentum. Movement Support Detachments (MSDs) are predictably positioned within an advancing column to assist rapid mobility along the designated routes. These units are task organized to fill craters, clear mines, prepare bypasses from major obstacles, and identify contaminated areas.(53) Their destruction by surprise indirect fires would create severe problems for a Soviet commander attempting to deploy his units under guidance and specific time schedules calculated by a higher headquarters.

Logistics sustainment for doctrinal artillery fires also provides a vulnerability for deep indirect fires to exploit. As an example, Soviet artillery norms require 30,000-40,000 rounds to be fired against a two battalion prepared defense, presenting approximately 60-70 targets. Accordingly, 2500-3000 tons of ammunition would be required for these fires. To permit this volume, Soviets and their followers rely upon forward stockpiling of ammunition along predesignated routes of march. Loss of such caches to surprise fires would significantly disrupt an enemy commander's ability to achieve the correlation of forces specifically formulated to accomplish his mission. Also, by doctrine a notional artillery regiment's stockpile would equate to 55% of available ammunition within a division.(54) If destroyed by friendly interdiction, artillery units would lack the ammunition required by present planning norms to successfully support an attack.

To oppose this threat and make these vulnerabilities work against an attacker, the LAI battalion must be both flexible and

powerful enough to strike the enemy before he can close with the friendly main body. These requirements are particularly important when faced with an enemy that employs sequentially echeloned forces to achieve an uninterrupted mass of combat power over an extended period of time. However, battalion assets will be limited. To effectively attack Soviet configured and employed forces, firepower must be adequately configured and enhanced by technological advances to improve accuracy, lethality and survivability.

Given its organization and characteristics of speed and mobility, the LAI battalion appears to offer a suitably structured force to conduct security and limited offensive operations. Security actions, principally the location, harassment and delay of the enemy, would support the generation of friendly combat power, the seizure of initiative and the effective conduct of subsequent offensive operations. Economy of force strikes could also be conducted throughout the depth of the enemy's operations to seek and engage previously noted vulnerabilities in command and control, engineer and logistics support assets.(55)

In security operations, two methods of delay might be employed. In a "low risk" delay, the LAI battalion would be deployed well forward of the main force to seek contact with an advancing enemy. Upon location, the battalion would delay and harass enemy elements utilizing organic weapons and close air support.(56) In this tradeoff of space for time, the further the distance from the main force, the better opportunities will be presented for successful employment with a minimal risk of being decisively engaged. While this method would exploit the battalion's inherent advantages of

speed and mobility over a large area, it would contrast markedly with the high risk delay.

A high risk delay is necessary when space is limited and the battalion is required to hold positions for protracted periods. The tradeoff of space for time would thus require a much greater intensity of violence, with increased vulnerability of decisive engagement and destruction.(57) Principal targets in this operation would be enemy command and control nodes and air defense systems. Successful targeting of these assets through an increasing application of organic and available supporting systems could blind and disrupt the enemy, inhibit the properly focused deployment of his main force, and provide the friendly main body with the time necessary to prepare engagement areas and killing zones against the enemy's detected point of main effort.

Economy of force strikes throughout the enemy's zone of action could further assist the commander in shaping the battlefield for future operations. If characterized by swift penetrations of enemy territory, these activities could serve to secure information, confuse the enemy, destroy key installations, or force the premature deployment of his forces. Operating well beyond ground support of the main body, LAI battalion elements would be dependent upon accurate intelligence, rapid movement to locate the enemy, and organic firepower to engage high value targets.

While the battalion's mobility and speed are essential to its survivability, security and economy of force operations also demand adequate firepower assets. As previously determined, to provide responsive support, these weapons must be as mobile as the rest of

the unit. They must also possess the lethality to accomplish significant destruction when employed. The superior characteristics of the 25mm chaingun and TOW II antitank system notwithstanding, the battalion's sole indirect fire weapons, consisting of only 8 M252 81mm mortars, are inadequate to provide the necessary combat power to engage high value targets of a mechanized and armored attacker at a survivable range, or to realize sufficient destruction of his rear area assets.

Despite this deficiency, compact and relatively inexpensive terminal guidance systems and increasingly lethal munitions are becoming available which will make it possible to engage pinpoint targets accurately with artillery and mortar indirect fires.(58) Consequently, improved capabilities might be provided by upgrading the battalion's organic indirect fire systems or augmenting them with field artillery assets. An analysis of the limitations of available systems and technological advances that may compensate for them, is necessary to arrive at a viable solution to the LAI battalion's firepower problem, and to recognize its implications for future force structuring and employment doctrine.

Cannon artillery systems have several limitations which counter their capabilities of all weather support and rapid concentration of fires. They emit a firing signature which increases their vulnerability to detection by enemy target acquisition assets.(59) They are also manpower intensive and possess limited capabilities for self-defense against ground and air attack. Further, towed artillery systems generally are not as mobile as the mechanized units they support and responsiveness is correspondingly hindered.

Additionally, their competing missions of close support to maneuver units and concentrated fires against massed enemy formations require a balanced mix of ammunition which results in a severe limitation of available precision munitions. This reduces unit capability to attack and destroy armored forces since non-precision munitions are incapable of achieving reliable accuracy against moving targets.

Mortars are the other indirect fire system available to the battalion, and consequently warrant serious consideration. While seldom regarded as an artillery system, mortars were in fact among the first artillery weapons. Today's mortars have their antecedents in the First World War. Originally a long-range bombardment weapon, the mortar was adapted to provide a flexible close support system for infantry due to artillery's retention for massed fires and its poor mobility under the conditions of the Western Front.(60)

Most armies have retained mortars primarily as close support infantry weapons since their adoption during World War I. Today's versions include a variety of calibers and methods of employment that range from 60mm hand-stabilized models to tracked self-propelled versions of 240mm. However, many mortars are no longer relegated to short-range close support roles, but are being employed as substitutes for cannon artillery. As previously mentioned, the German Army has configured its mountain units in this fashion. Also, the French, Israeli and Soviet armies retain larger caliber mortars as artillery. Although the LAI battalion's 81mm mortars are principally close antipersonnel weapons, upgrading their caliber and capabilities may prove an attractive alternative to augmentation by limited and possibly unsuitable cannon artillery.

However mortars, like cannon artillery, possess certain disadvantages. First, they project a high trajectory which makes them susceptible to enemy target acquisition. Second, their relatively low muzzle velocity, combined with their trajectory and long time of flight, results in a greater degree of round dispersion and inaccuracy. Third, their ammunition has previously been less lethal than the mix available to field artillery systems. Finally, the maximum ranges of mortars generally compare unfavorably with those of guns and howitzers.(61)

To overcome the above deficiencies, recent advances in cannon artillery and mortar ammunition have been focused on 155mm and 120mm systems respectively. Not surprisingly, both types have incorporated the latest technologies to provide increased range, lethality and accuracy. Three types of munitions appear to offer the greatest potential enhancement to the LAI battalion's firepower deficiency: laser designated projectiles; "cargo" projectiles, which deliver and discharge both antipersonnel and antiarmor mines; and fire-and-forget, "smart" projectiles.

Laser designated shells for both cannon artillery and mortars are currently in service. The 155mm M712 "COPPERHEAD" enables an observer with a fairly lightweight designator to accurately engage an enemy target at a maximum range of 16 kilometers.(62) Similarly, the German "BUSSARD" incorporates laser technology to complement the mortar's inherent top-attack capability. Designed for 120mm systems, the BUSSARD boasts a maximum range of 5 kilometers and is capable of penetrating the top armor of all Soviet armored vehicles.(63) Although laser-designated projectiles have proven

admirably lethal and accurate, current development efforts are directed towards munitions requiring no external designation source.

"Fire-and-forget" projectiles offer the attractive benefits of greater surprise and delivery system survivability. The 155mm version, termed "search and destroy armor" or SADARM, has entered its final development stages. Upon arrival over the desired engagement area, the projectile will discharge two SADARM sub-munitions, each of which will descend by small parachute and seek out armored vehicle targets using an integrated infra-red seeker.(64) Although SADARM remains under development, two mortar projectiles incorporating the same technology are already available for purchase: the Swedish "STRIX" and the multi-national "GRIFFIN." Both incorporate passive infra-red and millimeter-wave sensors to seek, locate and guide onto the more vulnerable upper surfaces of armored vehicles and are of comparable lethality to the 155mm SADARM. With an optional "sustainer" motor, the STRIX can attain a maximum range of 7.5 kilometers.(65) The GRIFFIN uses a comparable auxiliary propulsion system and has a maximum range of 8 kilometers.(66)

Other projectiles which would further improve the LAI battalion's firepower lethality and flexibility include "cargo" rounds. For 155mm howitzers, the M483A1 dual-purpose, improved conventional munition (DP/ICM) round contains 88 submunitions, each capable of penetrating up to 2.5 inches of homogeneous armor plate.(67) Likewise, the 120mm Spanish "Espin" projectile releases up to 21 submunitions, each capable of penetrating up to 150mm of steel armor, thicker than the upper protection of all Soviet armored

vehicles. Like the 155mm DP/ICM, "Espin" submunition casings also fragment on impact for an added antipersonnel effect.(68)

A final mortar projectile, similar to the still conceptual "fiber-optically guided munition" (FOGM) for cannon artillery, is in the final stages of testing by Boeing. Termed the "fiber-optic mortar projectile" (FOMP), it is expected to have a greater range than any other fire-and-forget munition by incorporating lifting surfaces that enable it to be "flown" by an operator. Target area imagery is provided to the operator though a fiber-optic cable attached to a camera in the projectile's nose.(69) Readouts from a miniaturized Global Positioning Satellite (GPS) navigation receiver will also give precise coordinates for accurate firing data and permit FOMP to be used to acquire future targets for subsequent attack in addition to engaging targets directly.(70)

In addition to ammunition improvements, the other notable advance in mortar technology is in lightweight, low recoil weapons. The most promising for application to the Marine Corps appears to be the Israeli RMS-6 system. Essentially a vehicular adaption of the Soltam lightweight K-6 mortar, which can fire all available 120mm projectiles detailed above, the system consists of a saddle mounted on a bearing which is bolted to the bed of the vehicle. The subsequently installed cradle and barrel are permitted 360-degrees of traverse. Even when firing 120mm shells with maximum charges, recoil forces have been found not to exceed those of 81mm systems. Of more relevant note to the LAI battalion, the RMS-6 system has been successfully installed and employed on the PIRANHA LAV chassis with no degradation in mobility or amphibious qualities.(71)

The preceding review of the future battlefield and analysis of historical examples have identified several factors relevant to determining a means of improving the LAI battalion's firepower. First, threat vulnerabilities offer targets which preclude reliance upon massive fires and lend themselves to precision strikes by relatively small firing elements. Second, while the battalion's firepower is inadequate to effectively engage these targets with a reasonable degree of self-survivability, technologies are currently available to enhance both cannon artillery and mortar systems to augment or supplant its present weapons. Third, as technologies close the traditional gap between the flexibility and lethality of cannon artillery and mortar systems, mobility requirements assume greater importance in determining which system is most suitable for selection. Finally, organic capabilities have proven most effective in providing immediately responsive fire support to maneuver units.

While the LAI battalion's firepower capability is critical, threat doctrine, command and control and organization present lucrative targets for interdiction enabling a commander to shape the battlefield. Unlike the threat's large maneuver and combat support forces, which require engagement by large concentrations of rocket and field artillery fires, targets vulnerable to deep interdiction strikes may be effectively engaged by only a relatively few precision rounds. Delay and disruption of the enemy would be accomplished through the removal or degradation of key support elements including command vehicles, air defense assets, and forward ammunition stockpiles. Additionally, given the threat's movement and deployment doctrine, targeting and fires could be accomplished from ranges beyond the immediate retaliation of flank guards, as

well as beyond the response times of follow-on formations. These results could be accomplished with a small, mobile firing element which would permit economy in force structure and retention of the preponderance of ground delivered firepower assets for standard support relationships.

With its organic weapons, the LAI battalion's maximum standoff range capability is currently less than 6000 meters. Provided by its 25mm chainguns, TOW II rockets and 81mm mortars, the LAI battalion's firepower is inadequate to effectively strike threat high value targets with a reasonable degree of success and self-survivability. However, as detailed above, technologies are currently available to enhance both cannon and mortar systems and enable them to either augment or supplant the battalion's existing weapons mix. In addition to providing the potential for precision destruction of both stationary and moving targets by "smart" munitions, the variety of available projectiles would enable the battalion to install hasty minefields at predetermined and critical chokepoints along the enemy's avenues of advance. If combined with enhanced real time and long distance target acquisition assets, such as remote piloted vehicles, these interdiction capabilities would provide the LAI battalion commander with the assets necessary to independently support his higher commander's deep battle intent. If so configured, the force commander would receive the added benefit of negating the friction created by the time consuming process of target acquisition, processing, dissemination, prioritization, mission development and implementation, all of which severely inhibit the timely delivery of fires on transient targets.

As technologies close the gap between the flexibility and

lethality of cannon artillery and mortars, mobility requirements must assume greater importance in determining which system is most suitable for selection. This is particularly valid within the current Marine Corps organization for combat, where most cannon artillery must be towed by truck or transported by helicopter. Cannon artillery systems available to support the LAI battalion are restricted to the 105mm M101A1 and the 155mm M198 howitzers. Although both systems could be transported by air using techniques similar to an airmobile artillery raid, doing so makes the operation weather, visibility and air-threat dependent. It would also require an almost prohibitive degree of prior coordination, and would defer availability of scarce fire support and helicopter assets from the remainder of the force. Thus, in addition to the variety and lethality of munitions, ground mobility of potential support systems in relation to the LAI battalion must be assessed.

Of the two cannon systems available to support the LAI battalion, the 105mm howitzer initially appears the most suitable. It has been retained for contingency operations and possesses a maximum range over 11 kilometers. It is also relatively light weight and may be transported by the PIRANHA family of vehicles when their towing pintels have been reinforced.(72) However, it lacks the amphibious capability enjoyed by its potential prime mover, and its use would constrain the battalion's mobility and operational flexibility. Further, U.S. 105mm ammunition research and development have been subordinated in recent years in favor of the 155mm systems; consequently, aside from harassment fires, the 105mm howitzer lacks the precision and lethality of more modern munitions.

Advancements in 155mm ammunition are ongoing and would permit the surgical strikes favorable to ground support in deep battle. Additionally, the M198 would provide the added benefit of extended engagement ranges from 18 - 22 kilometers for conventionally propelled projectiles, and up to 30 kilometers by rocket assistance. However, the M198 suffers from the same mobility constraints as its smaller 105mm alternative. It is heavy, slower moving than the remainder of the LAI battlion, and slow to emplace and displace. Further, it cannot be transported by the LAV and would impede amphibious movement by the supported battalion.

Considerably lighter and more flexible than cannons, mortars constitute the remaining available fire support system. As previously observed, the current organic 81mm system is inadequate to achieve the degree of precision and destruction required on the modern battlefield. Nonetheless, technological advances in mortar munitions, most notably in available 120mm systems, offer a likely alternative to increasing reliance on scarce howitzer resources. Upgrading the battalion's current 81mm mortars with a LAV-compatible 120mm weapon, and with a mix of smart and mine-carrying munitions would provide three major benefits. First, an organic firepower capability would be available with lethality slightly less than that of 155mm cannon systems. Second, engagement ranges for high value targets would be beyond expedient enemy retaliation. Third, systems compatibility including internal storage and transportation would permit full employment of the LAI battalion's amphibious capability.

Organic capabilities have proven most effective in providing immediately responsive firepower. While this is an obvious

observation, it connotes a recognition of the disparity between competing support requirements and a relative paucity of available assets for all potentially committed maneuver forces. The necessity to maintain adequate field artillery assets for standard support relationships of major subunits and the force as a whole remains valid, as does the need for a centralized control and firepower concentration capability. Additionally, even temporary augmentation by smaller artillery assets, such as a "dedicated battery," may prove an unacceptable risk given its comparably slow mobility and the corresponding degradation to its parent organization's capabilities when so employed. These factors noted, one must surmise that smaller maneuver forces, when operating beyond the protective umbrella of the main force, must be adequately configured to permit reliance on their own organic assets for all surface fire support.

Conclusion

Upgrading the existing 81mm mortar platoon with 120mm weapons and currently available munitions appears to offer the best solution to the LAI battalion's firepower problem. In synthesizing the preceding analysis, three reasons for this conclusion stand out. First, field artillery assets are limited. With the tank battalion considered another separate maneuver unit and the diminishing artillery assets available to the force commander, a Marine division is simply unable to provide a doctrinally-standard support relationship for the battalion. Similarly, a non-standard solution,

such as attachment, would be considered unacceptably risky. Further, given present budget constraints and inferences of future materiel and manpower cuts, additional assets requiring force expansion are not feasible. Second, the types and volumes of fires required under modern battlefield conditions against noted threat vulnerabilities can be accomplished using an improved mortar system and existing, more versatile munitions. Of the 120mm mortars available worldwide, the most promising appears to be the Israeli Soltam RMS-6 soft-recoil, lightweight system previously described. It can fire all "smart" and mine-laying projectiles and can be successfully "married" to the PIRANHA LAV with no resulting degradation in ground or amphibious mobility. Third, relating to the desirability of an organic solution, the personnel infrastructure is already in place with the existing mortar platoon to facilitate an upgrading of weapons systems. Thus, no additional personnel should be required to meet basic delivery system demands.

Doctrinal implications of the preceding conclusions include a requirement for reorientation of indirect fire perspective that would recognize mortars as artillery strike weapons rather than simply close support infantry systems. Additionally, an examination of the battalion's organizational structure for possible changes in the proportion of variant mix is necessary. Replacement of the present 81mm mortars with a more versatile 120mm system should reflect a recognition that the weapons are not for maneuver support. Their extended engagement range and greatly enhanced lethality can successfully replace less manageable cannon artillery systems in conducting deep ground attacks against high-payoff targets. This

concept conflicts with the contemporary American visage of mortars as a close-in infantry support weapon. If this concept is accepted, then it correspondingly calls into question the proportional utility of the battalion's other firepower systems. Speed and mobility being the key factors for its survivability, does the battalion require TOWs and the proposed assault gun variant in the present mix, when mortars with various projectiles possess equal lethality and greater versatility at greater engagement ranges? The answers to this question is beyond the scope of this paper; however, with the technological advances in mortars offering a glimpse at alternative support solutions, such a question warrants consideration in order to provide the LAI battalion with more effecive firepower on the future battlefield.

APPENDIX A: FIELD ARTILLERY TACTICAL MISSIONS

FA UNIT WITH A MISSION OF	ANSWERS CALLS FOR FIRE IN PRIORITY FROM	ESTABLISHES LIAISON WITH	ESTABLISHES COMMUNICATIONS WITH	HAS AS ITS ZONE OF FIRE	FURNISHES FORWARD OBSERVERS	IS POSITIONED BY	HAS ITS FIRES PLANNED BY
DIRECT	1. SUPPORTED UNIT 2. OWN OBSERVERS 3. HIGHER ARTILLERY HEADQUARTERS	SUPPORTED UNIT (DOWN TO BATTALION LEVEL)	SUPPORTED UNIT	ZONE OF SUPPORTED UNIT	TO EACH COMPANY SIZED MANEUVER ELEMENT OF SUPPORTED UNIT	UNIT COMMANDER AS DEEMED NECESSARY OR ORDERED BY HIGHER ARTILLERY HEADQUARTERS	DEVELOPS OWN FIRE PLAN
REINFORCING	1. REINFORCED UNIT 2. OWN OBSERVERS 3. HIGHER ARTILLERY HEADQUARTERS	REINFORCED UNIT	REINFORCED UNIT	ZONE OF FIRE OF REINFORCED UNIT	UPON REQUEST OF REINFORCED UNIT	REINFORCED UNIT, OR ORDERED BY HIGHER ARTILLERY HEADQUARTERS	REINFORCED UNIT
GENERAL SUPPORT	1. HIGHER ARTILLERY HEADQUARTERS	NO INHERENT REQUIREMENT	NO INHERENT REQUIREMENT	ZONE OF SUPPORTED UNIT	NO INHERENT REQUIREMENT	HIGHER ARTILLERY HEADQUARTERS	HIGHER ARTILLERY HEADQUARTERS
GENERAL SUPPORT REINFORCING	1. HIGHER ARTILLERY HEADQUARTERS 2. REINFORCED UNIT 3. OWN OBSERVERS	REINFORCED UNIT	REINFORCED UNIT	ZONE OF SUPPORTED UNIT TO INCLUDE ZONE OF REINFORCED UNIT	UPON REQUEST OF REINFORCED UNIT SUBJECT TO PRIOR APPROVAL OF HIGHER ARTILLERY HEADQUARTERS	HIGHER ARTILLERY HEADQUARTERS OR REINFORCED UNIT SUBJECT TO PRIOR APPROVAL BY HIGHER ARTILLERY HEADQUARTERS	HIGHER ARTILLERY HEADQUARTERS

Tactical missions establish the fire support responsibilities for an artillery unit. These inherent responsibilities are illustrated in the above figure, and reflect the following support concepts:

Direct Support (DS) requires an artillery unit to provide forward observer and liaison personnel to a supported maneuver unit, and plan and deliver fires in direct response to that unit's needs. Firing elements are positioned to best enhance the supported unit's scheme of maneuver. Although the fires of a unit assigned this mission may be directed to other purposes, such action is not initiated when it would conflict with the delivery of direct support requirements.

General Support (GS) requires a unit to support the force as a whole. Fires are controlled by the next higher artillery headquarters, and instructions concerning zones of fire and position areas are similarly provided. Units assigned a GS mission provide the force commander with an immediately available source of firepower which he can allocate to subordinate commands and thereby influence the outcome of widely separated actions.

Reinforcing (R) requires a unit to respond directly to requests for fire from another artillery unit. Although reinforcing artillery remains under the command of the higher artillery commander, the reinforced artillery unit will assign zones of fire and fire missions. The reinforcing unit is also responsible for establishing liaison and communications with the reinforced unit.

General Support/Reinforcing (GSR) requires an artillery unit to support the force as a whole and additionally respond to calls for fire from another artillery unit. An artillery unit assigned this mission displaces on order of the next higher artillery headquarters, or as requested by the reinforced unit upon approval from the next higher artillery commander. The GSR unit commander must be prepared to recommend actual position areas and to advise the higher artillery commander when displacement is necessary. Priority of fires is to the force as a whole, unless otherwise specified by the commander.

Source: See endnote 73

ENDNOTES

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