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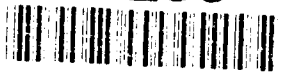

STUDY PROJECT

OF TANK AND INFANTRY: LESSONS OF HEAVY-LIGHT INTEGRATION LEARNED, FORGOTTEN AND RELEARNED

BY

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A-1

OF TANK AND INFANTRY: LESSONS OF HEAVY-LIGHT INTEGRATION LEARNED, FORGOTTEN AND RELEARNED

AN INDIVIDUAL STUDY PROJECT

by

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ABSTRACT

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> Infantry, cavalry, and artillery cannot do without one another; they should therefore be quartered so as to give mutual aid in case of surprise.[1]
>
> Napoleon's Maxims, XLVII

INTRODUCTION

Force structure is understandably a topic of interest today. There has been an ebb and flow as to how the Army should be configured. In January, 1990, after Operation Just Cause, the U.S. Armor School hosted a conference on "Armor Support to Light Infantry." Now, with the advent of Operation Desert Shield there is a clamor to rethink the need for conventional heavy forces for the mid- to high-intensity battlefield.

As we move away from reliance on forward-deployed forces toward a power projection strategy and restructure, we will retain in some ratio light forces and heavy. General George B. Crist, a former CINC, CENTCOM, noted that at least 12 Third World armies possess more than 1,000 tanks, long-range missiles, and chemical weapons.[2]

Light missions are actually focused on mid-intensity, and our light forces are troop listed for those regions:

> Nearly all Joint Strategic Capabilities Plan (JSCP) missions (for non mechanized forces to include the light divisions) reflect employment in Europe, Southwest Asia or Northwest Asia in a mid to high intensity conflict.[3]

Therefore, General Crist sets forth the need for both heavy and light forces and touches on the deployability issue:

> A mix of light and heavy projection forces (must) be retained in the U.S. active structure. The light components would be trained and organized to operate flexibly and at short notice anywhere in the world. They should be able to move rapidly and sustain themselves once they reach the target area. The heavy components should provide the backup combat staying-power in the event that deterrence fails or a given conflict intensifies. They, too, should be capable of deploying rapidly.[4]

General Edwin H. Burba, Jr., the FORSCOM commander, believes the optimum structure for the new contingency corps would be an airborne division, an air assault division, a light division and two heavy divisions,[5] an all-active corps that would be inserted quickly to stabilize situations on a global basis. The Army Plan of 1990 calls for "maintaining an appropriate mix of heavy and light forces that are modernized and capable of effective interoperability with forces of allied or other friendly nations."[6]

Whatever the optimum force structure may be, the facts are that in a period of diminishing resources we will lose heavy divisions from our structure. We have significant light forces (40+ non-mechanized infantry battalions in our active structure), and we have the ability to transport and put them in harm's way in short order. Light forces are not designed for sustained mid- to high-intensity warfare, yet they may be, of situational necessity, so utilized. Consider that the 82nd Airborne Division Ready Brigade closed in Saudi Arabia on 7 August 1990, yet the lead tank battalion of the 24th Infantry Division did not arrive in theater until 27 August 1990. Another time we might not be as fortunate as we were at the commencement of Operation Desert

Shield. Combat could occur on the front end. Light and heavy forces would be committed together.

The truth is the light divisions were not created to fulfill an operational requirement but to address low-intensity conflict; they are germaine to our own hemisphere and the Pacific in that role, match up (without augmentation) to our 1980's air lift capability, and give the Army a larger share of the defense budget.[7] This is our force structure and if someone invites us to a mid-intensity war, we will use it. However, it will be used in a way for which it was not operationally designed and may not have been trained. Until we can restructure based on the threat in the year 2000, in a multi-polar world, we must train and prepare our non-mechanized infantry to operate with heavy augmentation and vice versa. It has to be augmented to survive--even the 82nd Airborne, the heaviest of the non-mechanized infantry divisions, requires augmentation.

Senator Sam Nunn succinctly summarizes the situation:

> In general, Army light forces are rapidly deployable but lack sufficient firepower, sustainability and ground mobility; and in recent years Marine Corps forces have allowed their increase in equipment to outstrip their already inadequate amphibious lift.[8]

To insure the survival of light forces requires augmentation by heavy forces or the integration of light forces with heavy. So, the volatility of the world today, constrained sealift and the rapidity with which light forces can be inserted requires that when we wage war at the operational level, we "mix" forces.

The vernacular of today describes this blending as "heavy/light" or "light/heavy."

The combining of mechanized or armored forces with non-mechanized infantry has come to be known at the National Training Center and among our units as "mixed force operations" or "heavy-light/light-heavy integration." There are multiple forms of infantry: airborne, air assault, light (mountain, arctic, jungle), and standard. The one thing they all have in common is that after their insertion to the battlefield, they are <u>all</u> foot soldiers who attack or defend using the principles of fire and maneuver. When they operate with armor, they are a "tank-infantry" team or task force as opposed to an armor or mechanized team or task force. The terms "light," "non-mechanized" and "infantry" are used interchangeably in this document and simply mean foot soldiers.

This paper will briefly review how the structure has changed since World War II, but the real issue is training. As BG Joseph W. Kinzer said in 1981 as commander of 2nd Bn, 503d Infantry: "It's what you do with what you've got."

At first it might seem that heavy/light operations are an adaptation to deal with a force structure dilemma, but the prevalent wisdom to intermix these forces has its historical basis in World War II.

> In the heavy armored division there was always a shortage of infantry. Often battalions from infantry divisions were motorized and attached to the division to overcome this shortage. The principal disadvantages to this was that attached battalions did not have the training or

> experience of fighting with tanks and personnel of tank-infantry teams were not familiar with each other. The latter was found to be an important factor in gauging over-all efficiency of a combined team. Whenever possible it was found best to join up the same tank and infantry units together in training and in combat. Not only would staff sections function better but lower unit commanders and individual tank crews and infantry squads became acquainted and gained confidence in each other. Units gained objectives as a team and not as individual arms.[9]
>
> A 1947 Monograph, The Armor School

Over time, however, our institutional experience in the business of integrating heavy and light forces at the operational level has faded, and the WWII summary above could have been written at the National Training Center (NTC) in 1990. The average Bradley company at the NTC can only dismount 35 infantrymen on the objective (personal experience). In a mechanized division of five infantry battalions, roughly 1,000 soldiers are available when the Bradleys drop the ramp.[10] As of this writing, light infantry battalions have not been used at the NTC to offset mechanized infantry strength shortfalls as they were in WWII.

Our current stationing posture in CONUS finds light and heavy forces geographically separated. Our published field manuals are just now beginning to address, in draft annexes and appendices to field manuals, the common sense business of mixing forces for combat. Actual maneuver training of mixed forces at the brigade level (especially against a credible opposing force) is almost non-existent. With exception of the mixed forces scenarios provided by the NTC, the first large-scale operational experience at mixed force operations for the Division Ready

Brigade (DRB) of the 82nd might well have been in combat against the Iraqi Army. As an army, with some notable exceptions, we have not focused on the type of operations that terrain, threat, strategic deployability, force structure, and American interest demand we be able to execute with some skill.

If we are to employ light forces in a mid- to high-intensity conflict, are we not accepting unnecessary risk by augmenting them, with no training, after they are in combat in the theater? The only offset against this risk is training. When we do train together, it is clear that we have either failed to capture or institutionalize the practical lessons of our past.

> Combat is undeniably a hazardous occupation. The hazard, however, can be reduced by means of thorough and realistic training, the provision of supporting services, the continual refinement of tactical doctrine, and the development of more efficient weapons and equipment.[11]

Chapter 1

THE NTC EXPERIENCE

During the stateside maneuvers of 1939-1941 General George Catlett Marshall observed:

> The present maneuvers are the closest peacetime approximation to actual fighting conditions that have ever been undertaken in this country. But what is of the greatest importance, the mistakes and failures will not imperil the nation or cost the lives of men. . . . The maneuvers also constitute a field laboratory to accept or discard new methods of applying fundamental tactical principles.[12]

Today, the NTC provides even more of a combat approximation. It is the field laboratory of the present where units gain experience. It is also the crucible where lessons of World War II, since "unlearned," become evident; and lessons are "rediscovered" by each successive unit (despite the efforts of the Combined Arms Lessons Learned Center, the respective branch schools, and the Operations Group of the NTC).

One division commander asserted:

> I believe doctrine is being made every day at the NTC because you've got a tremendous evaluation process out there and they will be the first people to discover the weaknesses in our current tactical doctrine. And, they

> pass those on in the form of the after-action reviews to all the units. So, I think you're ahead of published doctrine if you're actively involved in the NTC.[13]

The NTC experience is, therefore, central to a true assessment of where we are as an army in training with regard to mixed-force (tank-infantry) operations.

The purpose of this paper is not to be a primer on capabilities of the respective heavy or light forces but to report the NTC experience in light of our army's history in mixed-force operations. The intent is to make the case for mixed-force training as a low-overhead, high-pay-off investment that can be implemented in the short term and should be pursued not only at training centers but in the FORSCOM Exercise Schedule and at corps and division level. NTC observations in this paper are based on the author's firsthand experience as the battalion task force senior trainer and observer/controller for non-mechanized infantry in both force-on-force and live fire operations during the period 1988-1990.

Heavy-Light Scenarios at the NTC

An NTC heavy/light scenario is seen as a part of a larger, mid-intensity scenario in which both heavy and light divisions are participating. The task organization is structured based on a reasonable approximation of the assets a light infantry division might send with a light battalion when it is attached to a heavy brigade and conversely, the assets a heavy brigade might logically send with an armored or mechanized battalion tasked to operate in support of a light brigade. The situation presumes

operations in multiple theaters so that virtually the entire active force structure of the U.S. Army has been committed.

At the beginning of fiscal year 1990, there had been 12 rotations of mixed forces at the NTC. Eight of those occurred in the period 1987-1989. In one a light infantry brigade served as the parent headquarters. In the remainder, a heavy brigade of two balanced mechanized/armor task forces was the base force with a non-mechanized infantry battalion attached.

A typical mixed-force rotation at the NTC will find the non-mechanized or light battalion operating for the first five days with a heavy battalion task force under the command of a heavy brigade headquarters in force-on-force operations while the second heavy battalion operates separately in live fire. The second five-day increment will find these same two task forces in live fire under a brigade headquarters resourced by the NTC trainers while the second heavy battalion is in force-on-force maneuvers with the parent brigade. In the final four days, the entire troop list operates together in force-on-force under the rotational brigade headquarters.

Light Infantry as a Force Multiplier

> It was recognized that the armored division, internally, required more infantry in proportion to tanks and, externally, would usually operate in closer proximity to infantry divisions than had been supposed. There was . . . an increasing rapprochment between tanks and infantry.[14]
>
> General McNair, 1942

The consensus today is that a light infantry battalion task force can make a significant contribution to the generated combat power of the heavy brigade, but that there is a bill to pay in terms of offsetting the firepower, survivability, and mobility differential. If properly employed with heavy forces, the light battalion can be an effective battlefield shaper. It can force the enemy to address multiple threats, and it enables the heavy force to maintain a higher OPTEMPO. The heavy brigade task force does not have to dismount the lead mechanized battalion task force to breach if a light battalion has attacked the night prior, cleared the obstacles, and eliminated the anti-tank emplacements that were covering the obstacle belts. The light battalion can destroy the enemy, unhinge him, and force his repositioning, all under cover of darkness.

There are, of course, coordination issues to be resolved: SOPs, style of operations, organization, communications, and fire planning. These usually begin to take shape toward the end of a rotation. However, there is a mobility differential which requires augmentation of the light units with transportation assets, as do the MEDEVAC, supply/resupply, and maintenance functions. Some of these differentials are structural, while others can be offset by training which enables each force to comprehend the nature of the other in terms of capabilities, limitations, optimum employment, and support requirements.

It is important to understand that the experience to date in mixed force maneuvers has seen a prevalent tendency to operate at the brigade level in a manner that employs the light infantry

and the mechanized/armored elements sequentially. The task organization chosen by the rotational brigade is usually pure, which in the offense will see the light infantry move at night and then the heavy force after beginning morning twilight. To a degree this is a function of the extreme openness of two-thirds of the NTC's maneuver space and scenarios which weight the accomplishment of heavy force training objectives such as movement to contact. There is also the matter of the extreme mobility/survivability differential and a concern for safety of foot soldiers born of unfamiliarity that drives, to a degree, this tendency to apply one force and then the other. This tendency is not unique to our history, but it would have been unusual at the division level and below as far as tank-infantry operations of World War II were concerned:

> For the final dash into Rome, the corps attached Task Force Howze, a two-battalion, armor-heavy task force commanded by COL Hamilton Howze, to the First Special Services Force to form a spearhead for the corps advance. The corps order directed Task Force Howze to lead the advance by day and the FSSF by night. BG Frederick (commanding the FSSF), however, later said that these orders were silly. Instead, as the senior commander, he used armor and infantry together--in a coordinated, continuous advance.[15]

The Germans also held very strong views on the subject. General Hermann Balck asserts:

> The idea of separate assignments for tanks and infantry was a sin against the essence of tactics: the cooperative employment of all arms against a single point rather than using one arm here and another over there.[16]

The Operations Group at the NTC works hard to offset this tendency in scenarios and has had the most success in live fire, where by virtue of being the brigade headquarters they can dictate the task organization and arrange situations that encourage if not demand low-level integration.

For ease of presentation, what follows is a report of NTC observations in the operating systems format. The seven operating systems have been so overused in our journals that they have almost eclipsed the principles of war, but they are useful for addressing in a coherent fashion the essential elements of combat operations. Not every operating system is addressed.

Intelligence

Light and heavy forces have different intelligence requirements as to priorities and level of detail. The 101st Airborne Division (AASLT) needs explicit detail on enemy ADA locations. A heavy battalion force is concerned with SA4's, SPIGOT, and anti-tank in general. A light scout may be unconcerned about the belts of wire and mines because he can walk around them, yet these same mines or obstacles in a trafficable wadi may be a war stopper for Team Alpha Mech. The light infantry element needs near A-1 intelligence as it cannot react to move another 5 kilometers in an attack with 30 minutes remaining until sunrise. If the intelligence is not firm, then the risk is that a light force may search, on foot, vast areas trying to find the enemy, increasing its vulnerability to direct and indirect fires. For this reason light infantry must orient

on the enemy on specific terrain in order to effectively mass combat power and contribute to the higher headquarters cffensive effort. Missions to seize terrain and destroy enemy on that terrain allow the light force to move directly to a clearly defined objective, secure it, destroy the enemy and conduct survivability/countermobility operations.

The timing of reconnaissance is critical as well. If the light task force is to be employed in an offensive operation tomorrow, then it may foot move 20 kilometers tonight in order to atack under the cover of darkness and be on the objective at sunrise to link up, support, and pass a heavy force. The light scouts must then get out early and cannot wait for the consolidated brigade reconnaissance and surveillance plan. In short, the light and heavy forces are on two different time lines for troop leading procedures. The brigade S2 must analyze faster. The brigade FSO must work quicker to target the S2's template.

It is not unusual for heavy forces to wander into unreported but known minefields and obstacles, or for the light forces to be committed against an improperly templated objective that is too shallow. Nor is it unusual to see air assault flight routes that overfly templated enemy air defenses. Light scouts are frequently tasked to observe targets that exceed their range of mobility and observation. Intelligence products and related fire plans are generated too late to benefit the light infantry. All of these negatives can and do improve over the course of a rotation. In intelligence as in all the operating

systems, it is not enough for each force simply to acquire a complete understanding of the capabilities and limitations of the other--they must actually train together.

Maneuver

There are three key points to be made about mixed-force operations under the maneuver system. First, mass is critical. Second, synchronization is very difficult. Third, a careful analysis of the mission is essential before the decision as to how to task organize is made. To be successful in a heavy-light brigade assault requires getting the light battalion and the heavy battalion task force to mass their combat power in the same place. Because light forces rely on stealth to mass their movement, there is a tendency to disperse and move on separate routes, with the result that piecemeal engagements occur. Mass at the decisive place is not achieved, and the heavy force is often then attritted and unsuccessful in its effort to breach and move to its objective. However, movement along one route with the task force broken into three to four march serials provides control and dispersion. Combat power can still be massed, albeit not as quickly as with the battalion in closed column.

In one force-on-force battle at the NTC, the brigade headquarters assigned the light battalion three separate company objectives each against a dug-in, motorized rifle company isolated by terrain and distance. In each instance the light battalion attacked at a ratio of less than 1:1 without success. The error was compounded in that both the light battalion and the

heavy brigade failed to mass. The brigade task force was defeated piecemeal.

In another battle a heavy brigade commander sent a light task force against two separate and exclusive objectives so as not to telegraph where he would make the main effort. The company to the south attacked a dug-in enemy without armor support at a ratio of 1:1 and was defeated. The battalion(-) in the north was attritted by artillery fire enroute and attacked the main objective, where the brigade(-) planned to penetrate, with only a reinforced company. This brigade did not reach its objective.

Synchronization of two divergent forces like heavy and light is very difficult when they operate separately, as has been the norm over time at the NTC, and attempt to arrive and mass at the same time and place. It requires careful time lining to give the light forces time on the objective under the cover of darkness and to insure the heavy forces arrive to take advantage of any success the foot infantry may have had. In one engagement at the NTC a light battalion, under cover of darkness, forced the repositioning of an opposing force motorized rifle company that was covering a major obstacle by fire. However, the heavy force had experienced difficulty in uncoiling the assembly area and arrived late by over an hour. In the interim the opposing force simply repositioned some three kilometers to a different vantage point from which they could cover the obstacle. The light battalion had by then been attritted, had exhausted most of its

anti-tank weapons, and was unable to reach the enemy again before the heavy battalion arrived and was destroyed in the fire sack.

METT-T

> In the break out toward Rome the FSSF took on a combined arms structure, with tank destroyer, tank, and armored reconnaissance units. Its task organization changed frequently (inter-mixing tank and infantry) depending on the factors of mission, enemy, troops available, and terrain.[17]

This difficulty in achieving synchronization in both the offense and the defense has led to a "separate sand box" mentality where heavy brigade commanders at the NTC solve the problem by using the light infantry as a separate "diversion" offensively and in a separate sector of the battlefield on the defense. There is nothing wrong with a separate sector approach if it accomplishes the brigade commander's intent.

If the METT-T mnemonic dictates no cross-task organizing, then by all means employ the forces separately. The example of MG Manteuffel and the Grossdeutschland division in the battle of Targul Frumos in Rumania in 1944 supports that course of action. With ideal terrain and over 30 days to prepare the battlefield and synchronize, he attached no armor to the infantry but held it all in reserve. The total Soviet losses were over 350 tanks and 200 armored fighting vehicles. German losses were less than ten tanks destroyed.[18] Certainly it can be carried to the other extreme, which can be seen in the experience of the 709th Separate Tank Battalion in WW II:

> The 709th Tank Battalion, in supporting the 8th Division, normally is allotted down to the point where one platoon is attached to each infantry battalion. This attachment is continued regardless of terrain or mission when in combat. Tank companies are not employed tactically as such. The battalion commander feels that considerable opportunity for support between tank platoons is lost and that in many cases tanks are not used in mass at the decisive point to support the major effort.[19]

However, there are times to put a mechanized team or a tank platoon with a light task force. Consider the NTC battle of "Red Lake Pass," where a light battalion had been employed separately on the flank of a heavy brigade with only its organic dragons and four M220 heavy anti-tank (TOW) guns and without tank or Bradley support. At the brigade level there was no contingency plan or graphics to facilitate the commitment of a reserve to the light battalion sector. The OPFOR's main regimental attack was thrown against the light battalion. Some 40 enemy vehicles were destroyed in the pass by direct fire and mines, but the second echelon motorized rifle battalion was able to break through intact and overrun the brigade support area. One tank platoon integrated into the defense either forward or to the rear of the pass would have had a telling effect on the second echelon. The OPFOR commander's decision criteria was triggered by the absence of tanks in the sector.

Why do heavy force brigade commanders regard non-mechanized infantry as something to be deployed separately (separate sandbox) when they clearly embrace the concept of combined arms integration within the mechanized forces of their own unit?

The entire history of our army argues for tank and infantry integration at the lowest level as the rule, not the exception. The NTC experience is one of rediscovery of this elementary principle. A common vignette is for infantry unsupported in force-on-force to sustain significant casualties from machine gun emplacements in a defile while fully night capable infantry fighting vehicles (IFV) remain in the heavy force assembly area. Another is for an infantry platoon, using the edge of a rugged terrain feature in an attack, to be acquired by a BMP with stand-off range and attritted until combat ineffective when there are IFVs and tanks in the battalion task force.

Fire Support

The fire support lesson most often relearned at the NTC is that there are no substitutes for a solid, detailed fire plan and control measures. The planning and clearance of fires is more difficult in heavy-light operations, especially where the forces assault sequentially. In one battle the infantry battalion was given an inappropriate mission to "raid" a strongpoint. The intent was that the objective area be clear of friendly forces when the heavy force brigade assaulted so that the brigade could bring the preponderance of its artillery to bear. The infantry was unable to quit the objective, sustained casualties to friendly artillery and was rendered combat ineffective. In another engagement the battalion was given only one hour to clear the objective. The inherent problem is that foot soldiers move over broken ground at a rate of 1 to 1-1/2 kilometers per hour,

and after commitment they may have a significant number of wounded to care for.

> Once troops have advanced toward an objective, they should never withdraw in favor of an artillery barrage, as ground once given is almost impossible to regain.[20]
>
> North Africa, 1943

The dilemma perceived by heavy brigade commanders is that the enemy will simply button up, back into his fighting position and call artillery on his own position. History, however, does not bear that out, and the solution, successfully exercised by some at the NTC, is to give control and clearance of fires to the FSO with the light battalion. He can effectively use measures such as FSCL, RFL, and no-fire areas to avoid a "separate sandbox" artillery fight. When asked to give some insight to this problem, COL James H. Dyson, a battery commander and forward observer with the 2nd Armored Division, reported his World War II experience:

> We would send forward observers with engineers to control and clear fires on the obstacles. I believe the observers with the infantry could do the same thing in the situation you describe. In World War II we had spotter planes in the Artillery. They were gone when I deployed a group to Vietnam. Infantry certainly has to dig in and be quick about it. The Russians were great artillerymen. They learned from us.[21]

The role of the infantry remains to get on the objective where the heavy force wants to penetrate at least two hours before sunrise in order to kill the armored vehicles and force their repositioning so that they are denied fighting from

prepared positions. Then the infantry digs in, links up with the heavy force, and evacuates its wounded. The optimum, however, might be infantry supported by fully night-capable IFVs and tanks seizing the objective together at night.

Mobility

Our NTC experience says that foot infantry can certainly be very effective at penetrating, breaching and clearing to open the way and support the assault of heavy forces; but it is all done with handtools and sections of "bangelore" torpedo that have been carried. If the obstacles are in successive belts over an extended distance of several kilometers, then the infantry simply cannot breach it all. It is better used to assault the emplacements covering the obstacles by fire. Infantry can certainly open the first belt and mark it to standard, but as a rule the heavy force must be prepared to breach in stride with engineers well forward.

At the NTC the tendency not to task-organize between the heavy and light battalions extends to combat support as well as combat elements. If the mission to breach a major obstacle was given to the light battalion, it was common for no heavy engineers (who had the real capability to breach) to accompany them; therefore, the critical obstacle to a heavy brigade's success would be undertaken with wheeled vehicles and shovels.

Countermobility

The degree to which light infantry can shape the battlefield is a direct function of the terrain, time available, and the density of engineer equipment. Operations at the NTC simply reinforce what we knew in World War II. The difference is that our non-mechanized infantry divisions have a significantly reduced density of engineer equipment and barrier haul capability. Light engineer equipment will not properly dig in tanks or even TOWs to standard. The JD550 backhoe will not cut a tank ditch, so the heavy force must provide the assets for obstacle construction. A light battalion can lay 3,000-5,000 mines, but it takes line haul that comes all the way forward to rifle company level to make that happen. The direct support engineer platoon cannot be in the long haul business. The 82nd and the 101st have five 5-ton dump trucks organic to the DS engineer platoon. The light divisions have only pioneer tools. The heavy brigade has to offset this. There have been instances at the NTC where this was successfully done and occasions where the materiel was simply not hauled far enough forward.

Survivability

The haul requirement for Class IV are extensive. The materials to construct field fortifications and overhead cover are not normally stocked as part of a mechanized brigade's Class IV. The light battalion, as with Class V mines, simply does not have the haul capability. This has to be offset by the heavy

brigade and its parent division. The significant anti-armor capability of a battalion of the 82nd Airborne Division can reposition in time to thicken the battlefield for a brigade commander if emplaced mounted. However, digging it in may mean not digging in a tank elsewhere, because the heavy commander must decrement his own survivability to provide the blade time.

NBC

Light forces have learned in the heat of the NTC desert to degrade the military-oriented protective posture (MOPP) during heavy work periods in the defense. Foot soldiers who move in MOPP with real weight ammo loads, as they do at the NTC, render the MOPP suit unserviceable and sustain excessive heat casualties. Instead, they have learned in the offense to go to a MOPP II level in the assault position. The real shortfall is in decontamination where a light unit is supported, under the light structure, by a DS chemical platoon equipped with three senaders, 55-gallon water blivets, and no personnel decontamination capability. Again, the decrement has to be offset by the heavy brigade with its fire-fighting equipment, 1,000-gallon water trailers, and other expedient equipment.

Combat Service Support

There is a significant difference in the self-sufficiency of our light divisions today and the standard infantry divisions of World War II.

At the NTC combat service support has proven to be the war stopper. Success has eluded more than one heavy brigade commander for lack of the transport to move foot soldiers in the numbers required and at the time needed. It requires 20 five-ton trucks to move the combat elements of a light battalion, and there are none organic save the two designed to move the field kitchen.

In a heavy battalion the supply system is supply point distribution, while in a light battalion the system is pinpoint distribution. If there are shortfalls in the heavy, the density of vehicles is such that a systemic problem may not be readily evident. When the light "push" system does not work, it is felt immediately. When we mix the two forces, we have learned at the NTC that a conscious plan is required to reconcile the difference. When each attempts to work his own system exclusively, things begin to come apart. If it is a light battalion attached to a heavy brigade, then the heavy brigade must adjust to push supplies. It requires seven five-ton trucks daily to sustain the LOGPAC function, linehaul of Class IV and V, and troop lift as required. Problems arise at the NTC because units do not train together, which is the only way that each can really learn how to operate with the other. The heavy force has to learn to anticipate and the light force to requisition.

If the operation requires support to heavy forces OPCON to a light brigade headquarters, then CSS is even more exacerbated. Whatever we intend to "plug in" to a light division base--especially at brigade level--must be modular, tailored, and self-

sustaining or come with the necessary support to permit attachment if the parent unit is not geographically present. In the 1990 light/heavy rotation to the NTC, significant portions of the Forward Support Battalion were present. This was an *ad hoc* arrangement, and a forward support battalion is not designed as a divisible entity. Before Desert Shield the XVIII Airborne Corps COSCOM was not prepared to repair the ITV, and I Corps is not structured or prepared to repair any heavy equipment. In Europe it is obviously not a problem. As we move to a "contingency" corps with more light divisions than heavy, this must be addressed.

A final area that requires augmentation is that of medical evacuation. Light battalions at the NTC over a two-year period had a comparatively higher died-of-wounds rate in force-on-force exercise simulation (30% mechanized infantry vs. 43% light infantry). The problem appeared to be the link from company aid station to battalion aid station. Augmentation of ambulance assets on a mission basis has proven viable.

Command and Control

Obviously, offensive operations involving these divergent forces are the more difficult to control. The NTC experience argues that in offensive operations, there is a 50-minute window of opportunity, after a light force has had some success, which the heavy force must exploit. The window closes when the OPFOR commits his reserve, fires FASCAM, or employs non-persistent chemicals. From the infantry perspective, link-up is paramount

especially if the assault was made unsupported by heavy direct fire platforms. Once the light force is on an objective, it is at risk and needs to be quickly reinforced by the heavy force. The enemy counterattack comes quickly after the loss of terrain, and the light force is then defending from hasty positions without benefit of mines and obstacles, with a diminished basic load of anti-tank weapons and against a heavily armored force. The command and control function is critical.

> All infantry commanders will thoroughly realize their personal responsibility for the coordinations, communication, and control of the tanks attached to their units in combat. There have been instances in the past where complete cooperation between the tanks and the infantry during combat did not exist. This has inevitably been caused by the failure on the part of the infantry commander to sit down with the tank commander concerned and thoroughly familiarize the tank commander with his plan of attack and to assure himself that the means of communications control were set up and tested prior to the jump-off. The infantry commander must know that the tank commander understands the infantry plan, and he must understand the tank commander's plan to support him. Unless this understanding is complete, the attack will inevitably bog down before objectives can be reached and organized.[22]

This does not come from an after-action report at the NTC. Instead, it is a memorandum distributed to platoon level by a corps commander in combat in Italy in 1944.

The lesson here, as this WW II commander realized, is that synchronization is both a process and a result. It is also a command responsibility. The plan must be kept simple. The 80% solution that allows flexibility with a clear mission statement is often the best. Common CEOI information, graphics and

terminology allow inter-operability and contribute significantly to mission success. The plans, graphics, and matrices for maneuver, fire support and combat service support all must be coordinated. Decision points and phase lines to trigger events must be designated. Second only to a simple plan, well articulated, is a quality rehearsal conducted early with the brigade commander and brigade operations officer leading and all the elements of combat power represented. Mixed-force operations especially require precise control measures, link-up and passage instructions and have the best chance for success when they are executed following a simple, well-rehearsed plan. The difficulty of these types of operation can only be comprehended in largescale mixed-force operations against a credible opposing force, whether at the NTC or elsewhere.

Live Fire and the NTC

As mentioned, the NTC provides the brigade headquarters for the heavy and the light battalion in the live fire phase of a rotation. As such the brigade operations orders and accompanying task organization are prepared by the live fire trainers of the Operations Group. A typical offensive operation may find a tank heavy team OPCON to a light battalion for the reduction and seizure of a strong point, then platoons of anti-armor detached from the light force to augment the heavy force after it has linked up and passed through and a light rifle company attached to the heavy battalion for a subsequent air assault to eliminate a flank threat once the heavy force has reached and occupied its

final objective. The opportunity is thus provided to the battalions to achieve true tank-infantry integration at as low a level as mission analysis dictates.

In one scenario the light battalion moves at night to assault positions and then, supported by its organic weapons, the heavy mortars of the armor or mechanized battalion, DS artillery, and tank direct fire, it breaches and reduces a strong point, all with service ordnance. All the elements to produce true combined arms integration are present in these scenarios. The underscored problem remains synchronization, which is only achieved through such realistic training opportunities.

Another scenario finds the infantry clearing a series of deep defiles over a six-kilometer route after an all-night foot movement of some 12 kilometers. There are no trucks and on more than one occasion in this scenario, tank-infantry teams have evolved on an unplanned, unrehearsed basis with soldiers moving as tank-mounted infantry, dismounting and protecting the tanks as required. This is the level of integration we need to achieve in training, but we can only do it if we deliberately set out to make it happen. The battalion task forces who undergo these exercises at the NTC are possibly the best in our Army at tank-infantry integration. The problem for the readiness of our force is that they are the exception in our Army's current situation.

So what was our World War II experience in "mixed force" operations? What was the evolution of tactical theory that saw the U.S. Army enter into that war structured as it was? What caused changes in that force structure? Did we really learn in

the sense of operationalizing our combat experience? What follows is an attempt to address those questions in the hope that by checking the "back azimuth," we can gain some sensing of where we should go or at least do not want to go again.

Chapter 2

EVOLUTION OF OPERATIONAL THEORY

> Arguments and counterarguments about the superiority of infantry and tanks, or vice versa, are essentially futile, for the two arms are complementary and the real problem is not to decide between them but to effectively combine them together.[23]

World War I gave rise to the view that armor was but an infantry support weapon. The purpose of the tank was to get men across no man's land, and it was logically armed with machine guns. General Heinz Guderian, architect of the German "blitzkreig," brought armor to the forefront as the "arm of decision" in 1940. The United States Army entered the war with the thought that armor was an independent force to be used for exploitation only. With the rise in numbers and effectiveness of anti-tank weapons, this faded away. Tanks were less able to defend themselves and needed to be closely supported by infantry. To keep up with the tanks, we went to half-tracks. In total, some 16 armored divisions with "armored infantry" were fielded, yet we fielded 67 divisions of regular or foot infantry.[24] [Armored infantry was transported in armored half-track vehicles, hence its name. It was found only in the armored division. The regiment had three battalions of three companies with three platoons to the company.]

B. H. Liddell Hart and J. F. C. Fuller, the leading military theorists in England between World War I and II, had differing opinions with regard to tanks and infantry. Hart, though giving precedence to the tank, always stressed the need for infantry as

an integral part of the mechanized force; whereas for the most part Fuller relegated infantry to a strictly subordinate role[25] of protecting lines of communication and fixed bases.

General George H. Patton believed it was simply a matter of organization: armor was prominent in the armor division and a supporting weapon in the infantry division.

> In an infantry division the purpose of supporting weapons--primarily tanks--is to get the infantry forward. In an armored division, the purpose of the infantry is to break the tanks loose.[26]

Field Marshall Erwin Rommel saw it in yet another light:

> The Infantry serves to occupy and hold positions designed to prevent the enemy from particular operations or to force him into other ones. Once this object has been achieved, the Infantry must be able to get away quickly to occupy positions elsewhere.[27]

The motorized infantry of Rommel was well equipped with 88s and 50s and thus so strong in anti-tank weapons that they could serve as a pivot point around which armor units could operate.[28] Panzer grenadiers were motorized infantry who followed closely and dismounted to move into action on foot whenever they encountered hostile fire.[29] In the defense the panzer division held key points with their infantry and counterattacked with their tanks.

As the war progressed, the combination of different arms in smaller groups made cooperation far more intimate and quicker. Infantry assumed the role of an active partner alternately leading or following based on the terrain and situation.

We ended World War II with our armored divisions spearheading attacks on all fronts against a disintegrating enemy. Armor was the arm of decision. Over time, unfortunately, we have forgotten that it was the infantry divisions with their attached tank battalions who slugged it out and preserved those narrow corridors that permitted such famous drives as that of the 2nd Armored Division. It is also important to remember that even in the exploitation it was not the mobility differential between tank and infantry that was the final limitation but the business of logistics:

> The average speed of Third Army after the breakout from Normandy was 15 miles a day. At its best, it covered 30 miles in one day. The speed and range of modern transport had been cancelled out by the huge consumption of modern armies.[30]

By the end of the War, the sequential employment of tanks and then infantry was superseded by closer cooperation between arms in smaller tactical groupings. The retention of tank units outside the armored division for use with infantry was practiced by both Soviet and U.S. armies.[31]

Chapter 3

FORCE STRUCTURE HISTORY

Before 1939 the infantry division included a company of light tanks in its table of organization and equipment. In July 1940 armor was removed from the divisions and did not come back as an organic element until after the war.

> All tank destroyers, all aircraft guns except the simple cal. 50 machine gun, and all tanks not in armored divisions or mechanized cavalry were pooled in non-divisional battalions . . . for attachment to divisions as needed. Lieutenant General Leslie J. McNair* was the architect and advocate of this concept.[32]

Lieutenant General J. L. Devers, then Chief of the Armored Force, was not an advocate of pooling. He believed that the occasional attachment of non-organic units to divisions would produce poor combined arms training and poor battlefield teamwork. Early in WW II, he wrote to General George Catlett Marshall that:

> Economy of force is not gained by having a lot of units in a reserve pool where they train individually, knowing little or nothing of the units they are going to fight with. It is much better to make them a part of a division or corps, even to wearing of the

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* General McNair became head of Army Ground Forces in 1942 and was in charge of all unit training and organization for the U.S. Army in WW II. He had great latitude to design and restructure forces. He was highly regarded for both his organizational and field abilities. He was killed in the Normandy invasion.

> same shoulder patch. If they are needed elsewhere in an emergency, they can be withdrawn easily from the division or corps and attached where they are needed. Economy of force and unity of command go together. You get little of either if you get a lot of attached units at the last moment. Team play comes with practice.[33]

In World War II we had separate tank forces for the support of infantry (non-mechanized) as distinct from armored-infantry (half tracks). Separate tank battalions were assigned to armies but attached to an infantry division and operated with it throughout the European campaign. Initially there were only 28 medium and two light separate tank battalions for 42 infantry divisions in the theater.[34] These were designated General Headquarters. The GHQ designation meant the tank unit was separate and to remain under control of the general headquarters of the division. In practice, medium companies were usually attached to each regiment. As a rule habitual association was followed for SOPs and to facilitate rest and maintenance whenever the regiment was out of the line. The battalion headquarters tended to become an administrative unit and advisory section only. The separate tank battalions and separate armored infantry battalions were identical to those in armored divisions and administratively self contained. The separate tank battalions were created by the 1943 reorganization which saw tank battalions withdrawn from each of the 14 armored divisions and the divisions reorganized. These added to a significant number already mobilized, produced a number of separate tank battalions roughly equivalent to the number of infantry divisions. Thus by the end

of 1945, 54 battalions of armor were in armored divisions and 65 in the non-divisional pool.[35]

There were initially not enough separate tank battalions to support even a portion of the infantry divisions in the total structure. One concern was that the result would be a degrading of the combat power of the armored divisions. An Army Ground Forces study of 1946 reported that:

> All experience on maneuvers and combat shows that failure to provide each infantry division with an organic separate tank battalion has lead to dispersion of tank battalions in the armored division for support of infantry divisions, thus tending to defeat the principle for maximum employment of tanks en masse with the armored divisions so currently stressed in our tactical doctrines.[36]

General Patton saw the necessity for the separate battalions but realized the inherent flexibility:

> There must be a careful differentiation between armored divisions and GHQ tank battalions; both are necessary. The GHQ tank battalions are used primarily for the purpose of supporting infantry, so that the integrity of the armored division is not destroyed. The present homogeneity of the battalions, however, makes it possible to add GHQ battalions to armored divisions when the circumstances demand additional armored force.[37]

Reports from theaters indicated that the normal procedure in combat was to attach a tank battalion to the division and that combat commanders were practically unanimous in urging that the armored unit be made an integral part of the division "to the end that, in training as well as fighting, a division might work with the same units. Only then, they held, could the necessary

teamwork between tank, infantry, and artillery units be developed."[38] To do that, of course, required the appropriate number of GHQ battalions in the structure, and General McNair believed we were not adequately resourced:

> It is believed that our 1943 troop basis has entirely too many armored divisions, considering their proper tactical employment, and too few GHQ tank battalions. It is particularly important that the latter be available in quantities to permit all infantry divisions to work with them freely and frequently. Such training has been impracticable in the past and probably will be so in 1943. This matter was brought up in connection with consideration of the 1943 troop basis, but the view presented by this headquarters was not favored by the War Department.[39]

With the successful employment of German anti-tank guns and mines from 1941 to 1943, and with a five-fold increase in infantry in the German armored division from 1940 to 1942, General Devers suggested "armorizing" infantry to move infantry divisions in carriers like the armored infantry of armored divisions. General McNair proposed the temporary expedient of a pool of 25 separate armored infantry battalions and on 28 January 1943 set forth that:

> We need large armored units to exploit the success of our infantry. We need small armored units also, in order to assist the infantry locally. The Russians appear to have devoted their armor largely to the latter principle, influenced undoubtedly by the fact that until recently they have been on the defensive strategically.[40]

Army Ground Forces proposed changes in the infantry regiment by AGF Plan 3, 26 February 1945.[41] The plan asked for a medium tank battalion as an organic part of the infantry division. At

the end of the war, there was an almost unanimous opinion of combat leaders that units which habitually had to be attached to the infantry division, such as armor, should be organic because of greater esprit de corps and teamwork, better understanding of SOPs, and an increase in morale of the attached units.[42]

> The General Board recommended a tank regiment for each infantry division which would habitually operate with one battalion in direct support of each assault regiment. The battalion in support of a reserve regiment would serve as a division reserve.[43]

After World War II the Army was of course demobilized and downsized in a short period of time to a record low. The separate tank battalions were methodically deactivated. The TOE for an infantry division in 1950 in Korea did provide for a tank battalion organic to the division and a tank company in each regiment. (Annex A, Appendix 3) This was only one-third of the structure recommended at the end of World War II and was roughly the WW II ratio. General Matthew B. Ridgeway, commander of the 8th U.S. Army, reported that all of the 8th Army's four infantry divisions were missing the tank companies which were authorized the infantry regiments. Only the 1st Cavalry Division had retained its organic medium tank battalion.[44] By 1952 the structure still retained a tank company organic to each infantry regiment with four platoons of five tanks each.[45]

The closest we come to implementing the WW II recommendation for structure was in 1954 with two tank battalions in the airborne division directly under division headquarters. Their companies were attached to regiments and rifle battalions but

could be employed in mass.[46] The "Pentomic" Division was implemented in 1956. It was built around five "battle groups" as opposed to the three regiments of the Triangular Division which had seen us through WW II. A battle group was smaller than a regiment but larger than a battalion. The infantry, therefore, lost the organic armor companies. This resulted in the deactivation of most of the tank battalions that had been organic or habitually associated with infantry divisions. After the Pentomic division came the fielding of the M113 armored personnel carrier. The ROAD (Reorganization Objectives Army Division) concept of 1961 brought the advent of the "mechanized" division. Existing infantry divisions in Europe were modernized as mechanized and armored. At this same juncture the Army entered its ground unit phase of the Vietnam War. The advent of air mobility, the 11th Cavalry Air Assault, and the general nature of this war saw reorganizations whereby the organic tank battalion fell out of the division's structure in favor of cavalry squadrons and troops. At the end of the Vietnam era, the 101st Airborne, the 82nd Airborne, the 9th Infantry Division, and other infantry divisions returned without armor, retained their RVN look and were georgraphically stationed separately from those units in their respective corps which had armor. Only the 82nd retained its M551 Sheridan* battalion. With the creation of

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* The M551 Sheridan remains the only air-droppable armored platform in our force structure. Its weight is 37,500 pounds, the limit wartime load for the C141 aircraft. It requires the downloading of some armament and basic load to meet this constraint.

mechanized infantry divisions, the standard infantry division had been relegated to a secondary role.

In the 1980's we fielded the light divisions. Today they in conjunction with our other non-mechanized infantry divisions comprise over one-third of our active army. Historically light (not standard infantry) divisions have not done well when deployed without heavy augmentation. The 10th Light Division (today the 10th Mountain) at a strength of 14,000 men was committed to the Mediterranean theater for the last four months of combat up the Italian peninsula. With its lack of organic heavy fire power and insufficient tank augmentation, it "suffered brutally for its short period in combat, 992 killed in action and 4,954 wounded."[47] Today we have no separate armor units to task organize with our infantry. To use our non-mechanized infantry requires augmentation, and to do that we must now do the very thing General Patton cautioned against, which was to degrade our armored/mechanized divisions in order to provide armor support to foot infantry.

Chapter 4

LESSON LEARNING

> By April 1951, the Eighth Army had again proved Erwin Rommell's assertion that American troops knew less but learned faster than any fighting men he had opposed. Americans had learned, and learned well. The tragedy of American arms, however, is that having an imperfect sense of history, Americans sometimes forget as quickly as they learn.[48]

> A "lesson" is an observation or experience resulting in new knowledge and "learn" means to gain knowledge.[49]

> A "lesson" becomes "learned" when it is incorporated into operational procedures and manuals.[50]

It was General Marshall who popularized the term "lessons learned" in the American army. "The Army became familiar with lesson learning and, thanks to Marshall's direction, used peacetime maneuvers as an experience-processing and doctrinal laboratory."[51] There are, however, three elements to lesson learning: collection, evaluation, and application. It is only when we change our procedures, our manuals, and our force structure that we have really "learned."

The German army was very careful to garner and then operationalize its war experience, especially early in the war:

> The German army, for one, was quick to evaluate its experiences in the campaign that crushed Poland in 1939, from which it drew lessons and made adjustments in organization, weapons, tactics and techniques.[52]

At the conclusion of the Polish campaign, the German army high command directed subordinate commands "in the interest of the

whole army to collect as soon as possible the combat experiences in both the tactical and technical spheres,"[53] to dessiminate these experiences widely among the troops, and to use them as the basis for the training of the replacement army. The German army in its lessons learned analysis of the Polish campaign did not use its studies to support existing doctrine but to improve doctrine. After action reports beginning at battalion level and continuing up to army became more critical of troop performance, training and doctrine. "The higher the headquarters, the more demanding and dissatisfied were commanders with operational performance."[54] The Germans were out to avoid the mistakes of the German high command of WWI in overestimating the ability and capabilities of the front line troops.[55]

In the Oberkommando des Heeres reports from Poland, one can read that infantry fire discipline was unsatisfactory and "the cooperation between weapons and branches had been inadequate. . . cooperation between infantry and armor had not always been sucessful."[56] In the U.S. Army the observer boards collated and the Infantry School in particular published in real time the combat experience and returned it to the field, albeit with a caveat that it was not "doctrine." In point of fact, though, it became doctrine if it worked.

> The American tendency to underrate the enemy, arising perhaps from an inflated national ego cultivated by eager commanders, was accompanied at first by an inability on the battlefield to learn from the experience of others.[57]

Did the U.S. Army learn the tank-infantry lessons of World War II? We did in the short term, as we reacted and organized the separate tank battalions. But in the sense the Germans learned, we really did not; for we failed to implement the recommendations of the General Board, U.S. Forces European Theater, in 1946 to change for the long term our Army's structure.[58] Today the Combined Arms Lessons Learned cell at Fort Leavenworth is tasked like the Board of Observers in the theaters of operation to collate and report the Training Center experiences. However, because we will not change our structure, remain geographically separate as heavy and light forces, and are only slowly bringing back references in our manuals, we are consigned to "rediscover" the lessons each time we operate together.

Chapter 5

WHAT WERE THOSE LESSONS?

THE TANK-INFANTRY EXPERIENCE OF WWII

> Cooperation does not work on the battlefield; someone must be in charge.
>
> MG Orlando Ward
> September 1945

> During the course of the attack, the supporting tanks were called upon to approach the position under attack. Infantrymen lying by the road attempted to hand-signal the approaching tanks that the road was mined a short distance beyond. The tanks did not stop for the signal and the first tank was disabled. Later on the tank men explained that they had interpreted the hand-warning of the infantrymen as cheering them on. This is an excellent lesson and teaches the necessity for preplanning with attached units down to the minute detail prior to the attack.[60]
>
> Italy, 1944

The World War II experience was the genesis of tank-infantry cooperation. Necessity and operational experience were truly the parents of invention as field commanders embraced what worked and disregarded that which did not. The realization that tank and infantry units must work together developed after the initial commitment of American units in North Africa. The need for specialized training to insure teamwork generated a flood of interest and requests from the field for more training before units entered combat.[61] In 1944, a great amount of information began to be generated in combat interviews, reports of observers,

and reports by field commanders. By the end of the war this experience was reflected in the Board of Observers Reports, articles, unit histories, and field manuals. Armor and Infantry School Monographs immediately following the war were excellent. It is from these sources that the following combat experiences were drawn. These experiences abound, and a few from each major theater are offered for perspective. Others are excerpted at Annex B.

In WWII the infantry divisions in the Pacific and in Europe believed that they needed tank, anti-tank, anti-aircraft and additional engineer support in virtually every circumstance when they were heavily engaged.[62] Where armor support was not provided, the results were grim:

> Walk with the rifle company commanders, who in January 1944 tackled those fortified houses at Anzio with rifle grenades as their only direct fire and without the help of the assault guns they should have had.[63]

On Omaha Beach American infantry were disembarked from landing craft to attack fortifications with flamethrowers and demolitions. It was done without armor. At Vierville and Les Moulins it was completely futile. In the end infantry and armor arrived through trial and error at workable attack tactics, but it took time and lives.[64]

> The fact that infantry cannot cross open beach as to close with fortifications was obviously not a remote or fine detail. Yet the best pre-invasion training plans did not provide for them (tank-infantry coordination).[65]

Before 1944 it was generally felt that infantry would not need tanks habitually and that tanks should be held apart for massed armored action. When enemy tanks assembled in large numbers, tank destroyers would be concentrated to counter the threat.[66] This, of course, changed through experience. Our first was at Kasserine Pass. There was a sincere effort to offset the experience factor before combat. GHQ had established the Desert Training Center in California and Arizona early in 1942 to place troops in a primitive environment where they would live and fight under simulated battle conditions. Unfortunately, the units who would fight at Kasserine Pass, the 1st Armored Division and the 34th Division, were already in Ireland. Martin Blumenson reports that the 1st Armored Division in its five months in Ireland before deployment to North Africa trained on small unit integration: "The stress was on small unit training and gunnery. The work improved tank-artillery cooperation, but tank-infantry and air-ground cooperation remained weak."[67]

At Kasserine Pass, in two days of battle the 1st Armored Division lost 98 tanks, 57 half-tracks, and 29 artillery pieces. Two battalions of the 168th Infantry sustained losses of 2,200 men.[68] In the whole of the battle II Corps lost 183 tanks, 104 half-tracks, 208 artillery pieces, 300 killed, 3,000 wounded, and 3,000 missing.[69]

> Units were dispersed and employed in small elements instead of massing as an integrated entity. Kasserine Pass was the catalyst for integration. By the late summer of 1943, Army authorities agreed that combined-arms training had never been satisfactory. Infantry and armored officers had had

> inadequate training in each other's operations. . . . Until late in 1943, armored and infantry divisions were unable to train together.[70]

The British provide some of the best tactical examples of tank and foot infantry successfully employed together in this same theater. In the breakout at Tobruk, the 19th Battalion of the 4th New Zealand Brigade and the 44th Royal Tank Regiment made a night attack.

> At a walking pace with the infantry company commanders walking alongside the tanks of the troop leaders who had been detailed to support them. The tanks carried pinhead taillights which acted as guides for the infantry following. There was no preliminary bombardment and the first the Axis defenders knew of the operation was the arrival of the leading Matildas in their positions. Tracks squealing, engines rumbling just above tick-over, the dark shapes pressed on slowly to the rear, spattering the ground ahead with machine gun fire. The defenders simply melted away and 45 minutes after they had crossed the start-line the crews of the leading tanks were shaking hands with the men of the Essex. . . . The cost of this brilliantly conceived action was one infantryman wounded.[71]

While a tactical level concern, the business of tank-infantry cooperation can be a major obstacle to the operational art. General Bernard Montgomery, as Commander, British Forces, North Africa, realized this in 1942-1943 and made the cooperation of arms a top priority.

> With inexorble determination he (General Montgomery) began eliminating the heresies which had bedeviled the army for more than a year, replacing them with a strict orthodoxy the canon of which was sustained co-operation between arms at every level. It was clear in the coming battle that the infantry would play a more important role than ever before. It would be they who protected the

> mineclearing sappers as they worked, and it would be they who fought to secure the breaches in the enemy defenses through which the armoured formations were to pass. The infantry, therefore, must have the maximum assistance possible, including their own specialist armoured support.
>
> Brigadier Richards, employed by Montgomery in an advisory capacity in the campaign in North-West Europe and his opinion highly valued, had taken over 23rd Armoured Brigade shortly after the Ruweisat debacle. He proposed that the brigade should become an independent formation specializing in infantry support, its regiments living and training with the infantry divisions with whom they were to fight. Montgomery agreed and added a fourth regiment, 8RTR, to its establishment, giving it a tank strength in excess of 200. In addition to training for the usual daylight infantry/tank attack, Richards was ordered to work out suitable tactics for night attacks. These consisted of infantry leading with the tanks following close behind. When the objective had been taken the tanks remained with the infantry to break up the inevitable counter-attack and did not leave until the latter's 6 pounder anti-tank guns had been brought forward and dug in. During the weeks that followed the method was carefully rehearsed with 1st South African Division, 2nd New Zealand, 4th Indian, 9th Australian and MG Douglas Wimberley's newly arrived 51st Highland Division. The sustained contact broke down many of the prejudices held by the infantry and developed a mutual understanding of the problems faced by each arm. If, for example, the infantry were held up by machine gun posts, the tanks would deal with them; if the tanks were held up by an anti-tank gun, it would be eliminated by the infantry.[72]

This lengthy extract not only attests to General Montgomery's farsightedness and willingness to innovate, but to the degree to which he understood the value of training. The proof was had in the coming months and especially in the opening

phase of the Second Battle of Alamein. This was Operation Lightfoot, and it is reported that General Rommel

> was shaken by the volume and flexibility of the tremendous artillery fire and depressed by the carefully rehearsed infantry/tank tactics which were steadily gnawing their way into his positions. The storming parties, he later wrote, were accompanied by tanks which acted as mobile artillery, and forced their way into the trenches at the point of a bayonet. Everything went methodically and according to a drill.[73]

Another excellent example of tank/infantry cooperation was in the break out attempt from Tobruk in a night attack by Company A, 2nd York and Lancaster Regiment, with 4th Royal Tank Regiment.

> The plan of attack was to subject the enemy position to a heavy artillery concentration for an hour. During this time A company was to advance, under cover of darkness, as close as possible and then, the moment the guns lifted, go into the assault. Meanwhile the tanks, using the same start line but on a different timing owing to their greater speed, were to assault simultaneously on the right. All went like clockwork. A Company's leading wave got within 50 yards of the strongpoint and, the moment the guns lifted, the roar of the tanks coming up right on time was heard. The attack caught the enemy with his head still down and large numbers fell to the bayonet and Tommy-gun. During this the tanks put down a withering fire on the back regions which effectively kept down that of the enemy.[74]

In the Italian theater, which was even more conducive terrain-wise to mixed force operations, the U.S. Army continued to learn and relearn the need for the closest cooperation between tanks and foot infantry.

> Tanks must be met with tanks, with tank destroyers back of them. But the tanks must either be attached to the infantry regiment or there must be extremely close cooperation

> between the infantry and tank commanders. When our regiment was hard pressed, tanks were sent up to support us. They stopped about 1,000 yards back of our front line and started firing, but it was area firing which did no good. If they had been under our command we would have ordered them forward where they could have done us some good.[75]

The learning continued all the way to Rome and, again, that which was functional and saved lives became the standard operational procedure for a unit, regiment, division or corps. Some of the best accounts of tank and infantry operational experience is found in the unit histories and reports of the separate tank battalions.

LTC Joseph G. Pelber, commander of the 753rd Tank Battalion, saw action in Sicily, at Anzio, Rome, Piombini, and Southern France. His unit was in continuous action with infantry for 266 days without relief, much of the time in mountain fighting. He reported that while either tank or infantry might lead, tanks remained far enough from the infantry so that an artillery concentration on the tanks would not strike the infantry. In this very mountainous terrain, enemy anti-tank guns positioned on the flank and sited for "key hole" shots were difficult to discover even after they opened fire and so the infantry took the ridges and the tanks fired smoke to assist infantry assaults when a gun was located.[76]

This type of operational discovery learning went on in every unit and at every level as the need for the closest cooperation at the lowest level was discovered and rediscovered. In the breakout from Anzio and the subsequent drive to Rome, the 3d Infantry Division made a main attack to Cisterna while the First

Special Service Force (FSSF), a joint US-Canadian infantry unit, with three regiments task-organized with armor and tank destroyers, advanced on the right.

> The men advanced more rapidly than their supporting armor. Consequently, a German counterattack of infantry and twelve Mark VI tanks forced the FSSF to fall back. Faulty coordination (or execution) with the attached tank and tank destroyer units caused part of the problem.[77]

MG Robert T. Frederick, Commander of the FSSF, when interviewed in 1949 reported that at the first opportunity he instituted tank-infantry training in the theater as a matter of necessity.*

In France the learning did not stop on the Overlord beachheads but continued in the breakout. The value of tank and infantry cooperation as well as that of all arms was underscored in the clearing of the Bocage country of Normandy where infantry casualties ran as high as 80%:

> While nothing new was developed as to the use of weapons, special formations and combinations of arms were developed to advance through this unique type of terrain. The most effective method of attack proved to be by combined action of infantry, artillery, tanks and engineers with some tanks equipped with dozer blades. . . . This type of fighting brought out the importance and necessity of perfect teamwork and cooperation of the various combined arms.[79]

Once the realization of the need for that cooperation was made, and with the separate tank battalions providing the

---

* During the period 9-22 May the FSSF conducted exercises with the 1st Armored Division that were widely emulated in the theater.

structure, the U.S. Army really came into its own as it broke the Siegfried line, fought through the Hurtgen forest, and pressed across Europe. (See Annex C, Infantry-Tank Cooperation) The tank-infantry teams were very successful in attacking the pillboxes in the Siegfried Line. The common practice was to join a medium tank company and a company of foot infantry. These would be broken to assault teams consisting of a section of tanks, an infantry platoon minus, and an engineer team with flame throwers. In this way the tank-infantry company fielded six assault teams.[80] The 741st Tank Battalion reported in their journals of September 1944 that:

> (the) tanks approached and fired into the embrasures of the pillbox at close range while the engineers, with the infantry platoon, placed charges and the infantry closed in to capture those who came out once the smoke cleared.[81]

The forming of tank-infantry teams with foot infantry was not limited to the separate tank battalions and the standard infantry divisions but was common practice to the overall theater of operations. As Colonel James H. Dyson of the 2nd Armored Division recalled (Annex D, App. 1):

> I will tell you that there was great effort expended in establishing the tank-infantry team. We had to have each other. It was common practice to attach straight leg infantry to armored units. They rode (on tanks) and/or walked. It was tough on the infantry, but it worked well. It has to be that way. We never fought without straight leg infantry.[82]

COL Dyson offered a battle example of foot infantry and armor which he personally witnessed:

> CCA, 2nd Armored Division, was trying to get through at St. Lo on the St. Lo to Paris Road. The U.S. Air Force (Army Air Corps) bombed the 30th or 31st Division (American), which had been leading, until it was combat ineffective. The 4th Battalion 22nd Infantry (foot) was attached by combat command "A" (CCA) to the 66th Tank Regiment and given the mission to take the lead and break through. I was with the 66th as a forward observer. Our commander believed battery commanders were the best forward observers. We attacked at night with the infantry riding the tanks. The infantry were trying to protect the tanks. I was with the lead tank company commander and had my head out so I could see. The infantry were shooting down off the tanks and even bayonetting the German infantry as we crossed through hedges and bomb craters. We were able to break through, expand the break, and let Gen. Patton's army come through.[83]

The World War II experience is exhaustive. The same points are made over and over. Perhaps it is best summarized by the editor of Infantry Journal in July 1945 when he wrote that by D-Day +310, the real secrets of success lay in three principals:

1) Tankers must know what the Infantry wants them to do.

2) Infantry must know what the tanks can and cannot do.

3) A mutual understanding and an attitude of full cooperation must exist between both.

The editor then goes on to describe combat occurrences that could easily have been extracts today from after action review video tapes at the NTC:

> Lack of understanding of mutual problems has led to heavy and unnecessary losses in both personnel and materiel. . . . An Infantry battalion commander is positive that the attack area is cleared of hostile ground AT guns and, without Infantry support, sends his supporting tank company to annihilation under

the direct fire of concealed 88s. A tank company commander is promised covering smoke for his movement by an open road flanked by mine fields, losing the bulk of his company because the request for smoke was not put through. Infantry commanders have failed to understand that tanks require time for maintenance and refueling; they have left tank units exposed and isolated under direct fire.

On the other side is the tank-unit commander who neglects physical time and space factors and fails to have his tanks in position to support the attack. There is the tank-unit commander who neglects to provide for the available artillery and engineer support of his part of the operation. And there is the tank-unit commander who does not appreciate the physical limitations of the Doughboy in hard going--and fails in his primary mission by running away from the Infantry.[85]

Chapter 6

TANK-MOUNTED INFANTRY

As a result of the migration of the separate tank battalions out of the infantry division structure (Annex E), one technique for combat infrequently used today, even at the NTC, is the tank-mounted infantry team. Over time the gradual geographic separation of tank and foot infantry has generated an overconcern with safety that is apparent in how brigade task force commanders task organize at the NTC, in small unit leader reluctance to mount soldiers on tanks or move together in an assault, and even in cautionary statements in draft doctrinal manuals about mixing forces. Yet there were operational experiences in WWII ranging from tanks used simply as a means of transport to actual assaults with infantry mounted as a matter of SOP.

In 1944 the Russian method of operation with massed armor was to have the tanks penetrate deeply and then to halt and bring up the greatest possible number of infantry during the night. Since German counterattacks were launched while the infantry were separated from the tanks, the Russians began in 1945 to assault with tank-mounted infantry.[86] Combat Command "A" of the 7th Armored Division went so far as to publish a training memorandum (Annex F, App. 2) making the movement of infantry on tanks standard operating procedure, not simply as a means of troop lift but employing tank-mounted infantry as a striking force. This memorandum was published in February 1945, well after the break out from Normandy.[87]

This practice was prevalent in other divisions as well. CCA, 2d Armored Division, and the 22nd Infantry devised a system where tanks were in the first wave with no infantry while the second tank wave had tank-mounted infantry to protect them from anti-armor. When necessary the infantry fought on foot in a regular infantry fight covered by tank fire. In the third wave there were more infantry on tanks as "moppers up."[88] Colonel Charles T. Lanham, CO, 22nd Infantry, explained to an Army Ground Force Observer in 1944 how this worked:

> We ride eight men on a medium tank and six on a light tank, all on the rear deck. It only takes ten minutes to train them. Therefore, we button up these tanks, get time fire from the artillery on them, and follow with the tanks carrying the men. The artillery observer rides with the leading wave and controls the fire setting his fuses a little high. To insure control of tanks by the infantry battalion commander and the tank commander I put them both in the same tank. The infantry battalion commander has his SCR-300 radio which he hangs on the outside of the tank and works directly with that part of his battalion which follows, in trucks or on foot. Infantry company commanders can talk to tank platoon commanders by telephones hung on the back of tanks. We fought this way with CCA 2nd Armored Division for eight days and nights in the sector, between St. Gilles and Marigny and the foot soldiers who were in this fight love this scheme. It does, however, have one disadvantage in that it does not capitalize on the full strength of the normal infantry regiment since it fails to utilize the heavy weapons company, the cannon company, the anti-tank company, and the anti-tank platoons of the battalion headquarters company. It employs only the rifle companies of a normal infantry regiment. We are going to try to utilize the heavy weapons company by riding it on tanks.[89]

COL Charles H. Coates, an Army Ground Force Observer, reported seven advantages to the employment of tank-mounted infantry:

> (1) German machine guns are always sighted for grazing fire about two feet off the ground. So if you've got the infantrymen up and behind the tank turret they are above this grazing fire and are protected from the front and partially from the flanks.
>
> (2) Men riding the tanks are moving targets. They move at irregular and unpredictable speeds and follow a changing course.
>
> (3) From any distance at all it is hard to pick up infantry on tanks particularly if you stick branches and camouflage on the tanks. Sometimes I haven't been able to see doughboys on tanks from 100 yards.
>
> (4) The Germans are trained to get into their holes when tanks roll over them and shoot at the following infantry. Instead our infantry is riding on top of them and can even get off and in their holes.
>
> (5) The Germans do not lay mortar fire on tanks but they do in the fields. The doughboys are up above the spray of the German mortar ground burst.
>
> (6) The doughboys get much better observation. They are blind on the ground but can see much more when up on the tanks.
>
> (7) There is the psychological effect of looking down on your adversary.

The more common method was to simply ride tank-mounted to contact (Annex F, App. 3-4). These practical operational techniques were reported not simply by observers and in the infantry publications but by the armor community. Consider this extract from the Cavalry Journal in 1945:

> In a rapidly moving situation, when the infantry cannot maintain contact with the

> enemy, the reconnaissance troop, logically, can best perform this mission. By riding 8 or 10 infantrymen "pig-a-back," a reconnaissance platoon gives to the following infantry first hand information whenever it is stopped temporarily by enemy action.
>
> By the same token, no time is lost by the infantry main body in becoming disposed for action, because the mounted point has the situation "diagnosed," and reduction of the enemy interference is materially quickened.
>
> Cooperation cannot be overstressed. Passing of information both friendly and enemy, to commanders, dispels the fog of the unknown and makes it possible to keep the enemy continuously off balance.[91]

The close integration of tank-mounted infantry practiced by the 7th Armored Division, the 2nd Armored Division, and most of the European theater in WW II was, however, lost by the time of Korea. Consider this after-action report from the Korean War:

> More than once it happened during this campaign that the infantry showed suspicion of mounting tanks; once they were mounted, they overcrowded the entire tank to an extent where the efficiency of tanks and crews was greatly reduced. The next problem was to make them dismount at the proper time when hostile artillery, mortar, or small arms fires landed in the area. The majority kept hugging the tanks; the few who did dismount crawled underneath the tanks, eliminating maneuverability. This faulty procedure was caused through lack of instructions from junior officers and non commissioned officers and resulted in considerable casualties.[92]

The techniques had been captured to a degree in the World War II Operations Divisions Information Bulletins (Annex F, App. 5) and included in a simple training circular (FM 17-36, Employment of Tanks with Infantry, 7 February 1944). However, units simply did not train in the technique and again with the passage of the separate tank battalions from the structure, the technique was lost.

Chapter 7

TANK-INFANTRY COMMUNICATIONS

When the separate tank battalions reached the field in Europe in 1944 and close integration became a practical matter, communications became a concern. Units progressed from field expedients to modification in the theater, and finally to changes on the assembly line. The first field expedients drained the battery.[93] Colonel Charles H. Karlstad, CO, CCA, 14th Armored Division, pointed out that the lack of infantry tank communiction equipment was making operations especially difficult. No exterior mounted telephones for the tanks were available except for a few improvised ones. This equipment was considered essential for village fighting.[94]

Units were unanimous in their appreciation of the effectiveness of the telephone mounted on the back of the tank. Their complaints were simply that not all tanks had been equipped with the phones and they had not been informed or trained in its use.[95] Units in the European theater put considerable effort into the business of communications within the tank-infantry team:

> The 743d and 747th Tank Battalions having worked for a considerable length of time with the infantry divisions which they are supporting have developed excellent tank-infantry team work and their relations with the division staff appear to be superior to that of any similar unit visited to date. At the time of the visit the 747th was engaged in training exercises with the 29th Infantry Division units, the purpose of which was to increase tank-infantry teamwork and particularly to acquaint small infantry units

> with the capabilities and limitations and to familiarize the small infantry commander with the outside telephone and other means of tank-infantry liaison and communication.[96]

Today we don't have a phone on the M1 or M1A1. When interviewed (Annex P, App. 1), COL James H. Dyson was asked how important the phone really was in World War II and was told our main battle tanks today do not have phones. He responded:

> Well, as soon as you get in a heavy fight, I'll tell you what you'll do. You'll be running field-expedient phones up onto the tank and into the turret. You can't be crawling up on the tank's deck once under fire. That doesn't work.[97]

Chapter 8

THE TANK-INFANTRY EXPERIENCE SINCE WORLD WAR II

> There are nevertheless many fundamental lessons we have learned in Korea, or more often relearned, that will apply regardless of the type of terrain or operation. Therefore, we can profit greatly from analyzing our deficiencies in Korean combat and placing appropriate stress on those subjects in training. Many of these deficiences are not peculiar to Korea--they can be found in historical studies from World War I and World War II. We are still making the same mistakes that are 35 years old.[98]

The U.S. Army still had some separate tank battalions by the time of the Korean conflict, but we had taken the "peace dividend" in training as well as force structure. Task Force Smith of the 24th Division went into combat against North Korean infantry and armor without supporting armor.

> Because it was impossible for infantry regiments stationed in postage-stamp garrisons like Camp Wood to train with their organic tank companies, the tanks were eliminated from the table of organization.[99]

Further, the 21st Infantry Regiment had never maneuvered with live artillery and had no experience with tanks.[100] We learned the business of tank and infantry all over again but never achieved the level we had in World War II. While we used armor in cavalry operations and in the Tet Offensive in Vietnam, that was not, during U.S. ground force involvement, a mid-intensity war that saw the use of heavy forces by the enemy on a regular

basis. By contrast the 1973 Arab-Israeli War provides an experience of some magnitude.

It accentuates the need for training and habitual association. Consider the attempt to seize and clear Suez City which failed. It was a tank and infantry operation of units that had not worked together. General Avraham Adan of the Israeli Self-Defense Force reports on the infantry that:

> Neither their equipment nor their vehicles, neither their training nor their inclination fitted them for armored action . . . the faulty cooperation between these two elements only detracted from the effectiveness of the forces.[101]

Later when the Israelis were five to six miles across the Suez Canal and north of the Great Bitter Lake, an armored column forced its way into Kantara but was ousted. The 190th Armored Brigade mounted a full counterattack without close supporting infantry and was routed with heavy casualties.[102] General Adan's division actually lost two tank battalions to Egyptian infantry "on ground that had little vegetation, no built up areas for concealment, and the soil was poor for entrenching. His defeat was only reversed by the addition of infantry."[103]

In Operation Just Cause, Panama, December 1989, the 82nd Airborne effected close cooperation with their organic armor. The equivalent of a tank company was placed OPCON to infantry battalions as required. These were further OPCON to infantry platoons and squads as a section of two to four tanks. The infantry then lived with the tanks, protected them, rode on the deck, talked on the exterior phone and evacuated casualties on

the back deck. The infantry protected the tanks and directed their fire by identifying targets by building, floor and window or designating by "watch my tracer." The hindsight from this operation was to train for MOUT as tank-infantry teams and to conduct frequent unit battle drills of tank and infantry in "live fire" exercises.[104]

Our experience as an army is, if one thing, consistent over the past 45 years. The lessons are learned and relearned and the same process will continue whenever and wherever tanks and foot infantry find each other. It is only offset where we have a commitment to train and do so with a purpose.

Chapter 9

THE PSYCHOLOGICAL ASPECT

> Men will not hold their positions when hostile tanks get in behind them while enemy riflemen are crowding them in front. This may not fit our theories, but it is a fact.[105]
>
> Anzio Beachhead, 1944

To what extent does the addition of armor to an infantry element affect the psychological outlook of soldiers? Does it add a dimension? Here are five short excerpts from combat actions. The first was in the Hurtgen Forest in World War II.

> While clearing the road from Pinkenbur to Lammersdorf on 15 September 1944, Company A, 39th Infantry, without tank support, was held up trying to secure an important road junction. The arrival of two tanks to support the infantry caused the enemy to withdraw without further fighting.[106]

The second concerned the 82nd Airborne Division on the Rhine. In describing the fight for the Nijmegen bridgehead, General James Gavin, Commander, 82nd Airborne Division, records how the paratroopers of the 504th greeting the tanks of the Grenadier Guards on the north shore were "so enthusiastic that one of them actually kissed the leading British tank" and how the 505th then cleared the Germans from roof top to roof top supported by tanks.[107]

The third comes from a General Board interview with the commander of a tank destroyer group:

> The appearance and the knowledge that self-propelled tank destroyers were at hand was a major reason that the infantry attained success and victory. Often many men die or

> suffer to take important objectives and others will die or suffer to retain them if the inspiration furnished by the presence of the self-propelled tank destroyer is known. . . . An infantryman has his fortitude well tested, and the mere presence of self-propelled tank-destroyers in his immediate vicinity gives a tremendous shot of courage to the committed infantryman.[108]

The fourth incident was experienced by the 1st Cavalry Division when it was holding a 38-mile sector north of Taegu in the Korean War. The 70th Tank Battalion was providing close support to infantry "retaking" a hill dominating the Waegwan-Taegu highway. The commanders noted that "the psychological effect that supporting armor had on our infantry was shown by the aggressive manner in which the enemy was engaged and defeated."[109]

The fifth reflects the experiences of the 82nd Airborne, 45 years later, in Operation Just Cause. It is taken from observations by LTC James Grazioplene, Commander, 3d Battalion 73d Armor, 82nd Airborne Division:

> The presence of the M551 Sheridans raised the morale of friendly forces and Panamanian civilians. They had an extreme psychological effect on enemy forces and looters. Once Sheridans moved into an area, after an initial engagement with the M551A1's, enemy forces generally refused to fire or snipe at convoys or positions in the vicinity of the Sheridans.[110]

There are numerous examples from all theaters that suggest there is a dimension that directly affects the will of units, both armor and infantry.

Chapter 10

THE COMBAT SERVICE SUPPORT EXPERIENCE

> There is nothing new in all this. The only newness probably lies in attention to things that are old, but still true.
>
> MG Leland S. Hobbs
> CG, 30th Inf Div, 1945

A study of the World War II experience reveals that the leadership wrestled with the same issue of sustainability for foot infantry in mixed force operations as we do now. In combat service support, the "light" divisions of that day were similar in structure to today's divisions. One study on this subject reports:

> The light forces have no sustainment capability and lack sufficient organic firepower. These are the same reasons why General MacArthur did not want light forces in his theater during World War II. They would have required too many of his assets to make them a viable fighting force. The concept of pooling assets at corps instead of making an element a viable fighting force has been a continual debate since World War II.[111]

Historical reports of World War II showed that pooling assets at corps and providing them as needed to weight the main effort did not work. Habitual association was established by corps elements with divisions.[112]

Today's concept of corps plugs is no different than WWII. It has been called the "round-up" concept. Light divisions deployed to a theater would be supported with additional augmentation of artillery, air defense, engineers and service

support units. Again, the training issue arises and is perhaps best phrased in this excerpt from Janes Military Review:

> How effective "round-up" will be in practice is uncertain. The light infantry divisions would certainly have to train with their proposed augmentation force in peacetime if they are to cooperate effectively in war.[113]

The crux of the problem, of course, is that training is not happening. The light divisions were canvassed on this subject for the Commandant of the Infantry School in 1986:

> The divisions . . . indicated uneasiness about the system because they do not know who the "plugs" are, where they are located, how long it will take them to get there, and in the case of CSS assets who has control over them when they arrive.[114]

This report has already set forth the functional areas of sustainability, mobility and survivability of light forces as they are being reckoned with today at the NTC. The aspect of mobility or transportation affects sustainability as well. The transportation structure today finds that a light division can only lift one battalion with a surge of all its assets. Significant organic assets are consumed in self-sustainment. This was the case for the "light" divisions of WWII: "Because of their reduced organic transport, they could not properly supply themselves."[115]

The standard infantry division of WWII, however, was different, and it was by no means immobile. All elements but the infantry were motorized. With its organic trucks the division could move in short bounds by shuttling its trucks, dumping their loads, moving the infantry, and returning for their organic

loads. "It could move personnel and equipment at the same time with six QM truck companies each operating 48 2-1/2 ton trucks."[116] Today's infantry divisions, e.g., 2nd ID, 82nd, and 101st, as opposed to "light" divisions have nowhere near this capability. They do have significantly more capability than their "light" counterparts. There has been a conscious, incremental phasing out of organic infantry division transportation since WWII. Here, for example, is a capsulization of the impact of the shift to the "Triangular Division":

> Although the battle group requires considerable supporting transportation for all types of operations, it does have a limited amount of organic transportation. Besides the combat and command vehicles throughout the battle group, there are five 2-1/2 ton trucks with 1-1/2 ton trailers (in the Headquarters Company) for transporting mess equipment, company individual rolls and reserve rations. Each truck does the job of two in the Triangular Division.
>
> The rifle company has four 1/4 ton trucks and four 3/4s. The loss of the 2-1/2-ton truck makes the company dependent on battle group for transporting individual rolls, chemical kits, demolition sets, armorers tools, wire cutters, panel sets and equipment which is not used every day.[117]

In the shift from regiment (371 vehicles) to battle group (124), the infantry had 66% fewer vehicles and the battle group became 37% mobile with its organic vehicles. By using all of the transportation battalion's organic 2-1/2 ton trucks (80) and armored personnel carriers (114), two battle groups could be made 100% mobile.[118] The conviction in the switch from triangular to pentomic infantry division was that we could do more with less as

the transportation was more functional and utilization was more centralized.

Today's non-mechanized infantry units are dependent for their transport not on battalions but division and corps. This is a serious operational decrement. Here is an excerpt from the VII U.S. Corps After Action Report to the USAEUR Commander for a recent Reforger:

> During Certain Challenge 88, the LIB (light infantry brigade) required a significant percentage of 2nd COSCOM's fleet of five ton cargo trucks as troop transportation during the deployment phase. In order to support the LIB, all five ton cargo trucks asigned to the 4th Transportation Battalion (previously directed for turn in), as well as 20 organic mission vehicles from 2nd COSCOM units were required. The diversion of a large amount of transportation assets reduced 2nd COSCOM's ability to move supplies and repair parts forward to VII Corps MSCs and its own units from which the organic five tons had been obtained.[119]

In most NTC mixed-force rotations the necessary support for light forces is generated by similar ad hoc arrangements within the host heavy division. Corps plugs are perceived as a panacea. The question as to what extent they really exist may not have been satisfactorily examined.

The fact that the task organization for heavy-light operations is on an ad hoc basis leads one to believe that our support structure may limit the extent to which we can utilize that third of our combat structure that is not mechanized. By way of example, if we task organize a heavy brigade OPCON to a light division, the heavy brigade takes its Forward Support Battalion (FSB) and some of the main support battalion, plus ASL;

but if we place a heavy battalion subordinate to a light brigade, then we have to subdivide the brigade FSB and other resources that were not designed to be fractured. Corps plugs can facilitate a limited contingency operation but do not exist to support a theater where multiple light brigades have been attached to heavy divisions (e.g., infantry transport), much less support a theater where a heavy brigade falls in on a light division.

We need to see if force structure will support large scale operations where multiple divisions are mixed. We then need to deploy those units in support of combat training center rotations. Arguably, if the XVIII Corps is to be our contingency corps, then perhaps all the corps plugs need to be active.

CSS limitations further argue that corps plugs of combat service support should be modular, tailored and self-sufficient by organization to support light forces or come with the necessary support to permit attachment if the parent unit is not geographically present.

The combat service support aspects of all our contingency plans entailing the integration of mixed forces need to be examined at corps and division level. SOPs setting forth all classes of supply and services, maintenance, medical, and transport should be laid out for generic force mixes both heavy-light and light-heavy along the lines of known contingency plans. Most efforts in this regard are occurring at brigade level by the few brigade commanders who have led a mixed-force rotation to the National Training Center. This effort, however, should be more

formalized and methodical with planning guidance and SOPs issued at corps level.

Chapter 11

DOCTRINE

> In its ultimate relationship to the human understanding, this central idea or "doctrine" is nothing else than common-sense, i.e. action adapted to circumstances.[120]
>
> J. F. C. Fuller

Dr. Williamson Murray has suggested that military organizations have attempted to learn from experience but that they tend to extract from those experiences only what supports their preconceived notions. He posits that existing doctrine may actually become a barrier to adaptation and improvement.[121] Over time paradigms develop. An example would be the tendency to employ foot infantry and armor separately. Since that has been the "state of nature," it de facto becomes the doctrine, albeit by omission; and then it becomes the doctrine de juris. To illustrate the point, FM 100-15, Corps Operations, dated 15 November 1988, addressing task organization says: On rare occasions . . . heavy and light forces may be task organized below brigade level."[122] A de facto illustration is the first effort draft of FM 71-1-2-3, Tactics, Techniques and Procedures, which has omitted mixed-force operations.

Reviewing the doctrinal manuals of the WWII era gives an insight as to how "common sense action was adapted to circumstance." There is one mention of tanks in the 1942 Infantry Field Manual, and they are mentioned as operating separately to provide supporting fires.[123] (Annex G, App. 1-2)

By 1944 this same level manual devotes several pages to the close integration of tanks and infantry.[124] FM 17-36, Employment of Tanks with Infantry, 7 February 1944, was published the same year. In both manuals, specific techniques are discussed which had evolved over the course of the war. These are excellent and as tactically sound today as in 1944 but have fallen from our manuals. (Select pages are extracted and republished at Annex G, App. 3-4.) Even the 1944 manuals, however, lack the specificity desired in the view of some WWII division commanders. MG Orlando Ward, quoted in Infantry Journal in 1945, said:

> I am afraid we are leaving to happenstance the necessary team play on the battlefield between the infantry and the armor. We certainly must put in our text clear-cut means and methods for this cooperation. Much is left to inspiration.[126]

In 1952 the Infantry School taught five methods[127] of tank-infantry team attack (non-mechanized infantry):

1. Tanks accompany and operate with the infantry at the same speed.
2. Tanks initially support by fire and then move forward rapidly to join the infantry for the assault.
3. Tanks initially support by fire and then move forward rapidly to pass through and precede the infantry on the objective.
4. Tanks and infantry converge on the objective from different directions.
5. Tanks support the infantry by overhead fire alone.

In 1953 the Infantry School and the Armor School agreed on some basic tank-infantry team doctrine for the attack with non-mechanized infantry. They had set forth three simple methods[128] (Annex G, App. 6) that were taught for the next several years:

1. Infantry and tanks on the same axis.
2. Infantry and tanks on converging axes.
3. Tanks support by fire only.

These methods could be combined and fitted to the situation, and a number of techniques surviving from the combat experience of WWII were integrated.

Significant, practical experience from WWII was captured in Infantry and Armor Advanced Course student monographs in the period between WWII and Korea.

> On an exploitation combat commands marched in from one to sometimes three columns. Each column was organized into a tank-infantry team usually not less than battalion strength. Many of the actions in an exploitation were advance guard actions. The point was generally made up of a section of medium tanks. The advance party was composed of a medium tank platoon with a platoon of infantry mounted on the backs of the tanks. The remainder of the infantry with the advance guard rode in their vehicles in the support element. On long marches the infantry riding the tanks was rotated to rest them. Their half-tracks followed at the rear of the main body. This shortened the column and made the infantry immediately available should they be needed. The infantry in the main body usually moved mounted in their vehicles.[129]

Yet these were largely ignored in the field manuals of the late 1950's as the structure changed. Then the U.S. Army became

focused on jungle warfare and the age of the helicopter as an assault vehicle arrived.

The Cavalry, Armor, and Infantry journals of the period (1945-51) detail the need and the "how to" of tank and infantry integration. The report of the General Board of WWII advocates organizational structures that formally integrate tank and infantry. Yet some 45 years after what should have been our doctrinal bedrock experience, we have migrated to a geographical and operational separation of tank and infantry. True, we have mechanized infantry and armor divisions where integration occurs; but we have seven infantry divisions where the majority of the soldiers are unfamiliar with armor and the officers, despite efforts to rotate assignments from heavy to light tracks, largely are not experienced at the operational integration of the forces.

Today we are beginning to readdress mixed-force operations in our doctrine. The August 1990 draft of FM 7-30 devotes Appendix C to the subject and is on target with its language:

> The purpose of employing heavy and light forces together is to capitalize on the unique characteristics of each while offsetting the limitations of the other. Employed together as a "mixed force," based on a sound METT analysis, their mutual combat effectiveness can be exponential. To accomplish this, commanders must understand the capabilities and limitations of each force. They must be able to apply the principles of war to light-heavy operations and synchronize the efforts of all combat, combat-support and CSS units.

Some other excellent efforts have been made to address heavy-light and light-heavy operations. But our geographic separation and the reality that our heavy and light forces

will generally not read each other's manuals leaves us short of where we need to be unless we force the issue at the respective schools and centers and not solely at the officer level. We can make some progress with our manuals and are off to a good start, but the pay-off is secondary compared to the benefit to be had from full scale maneuver and mixed-force live fire.

> In no other profession are the penalties for employing untrained personnel so appalling or so irrevocable as in the military.
>
> Douglas MacArthur
> General, U.S. Army

Chapter 12

LEADER DEVELOPMENT

> It has been noted in this campaign that many non commissioned officers of branches other than armor have little or no knowledge of the use of tanks. During times of confusion or when their officers became casualties, it was up to their NCO's to assume command of a small unit. Due to their ignorance of basic tactics of other branches of the service, combined operations of this kind were sometimes unsuccessful and resulted in heavy casualties.
>
> Korea, 1950

The situation described above was not unique to Korea but was characteristic of Vietnam as well. Unfamiliarity was the rule in all theaters by the early 1970's. Consider the experience of an armor company commander in Europe in 1971:

> I reported to the Infantry battalion commander the evening before the test (Army Training Test/EXEVAL) with no prior experience in working with an infantry unit. Although I was familiar with the doctrine of Infantry employment, I lacked the knowledge and experience which results from actual experience. As the test concluded, I learned that my platoon leaders who were attached to the Infantry companies encountered problems similar to my own.
>
> As a tank company commander in Germany, I worked with the Infantry only once a year, and then only for a few short days in the field. This is clearly not enough time to

> develop and maintain proficiency in commanding combined arms teams.
>
> A year later I found myself in Vietnam assigned as a straight leg Infantry company commander, trying to recall everything I had learned about Infantry tactics.[131]

Granted this was Europe 20 years ago and the setting was a heavy division, but it could as easily be the report of a combat arms officer describing his experience at the NTC in a heavy-light or light-heavy contingency rotation or that following an exercise in Desert Shield between the 82nd or 101st and the 24th Mechanized Division.

There is a clear opportunity to make progress toward mutual cooperation and understanding by leader development. Cross fertilization during officer schools at every level and increased mixed-force scenarios in our schools could be initiated. Faculty exchanges beyond the one officer of the other branch at armor and infantry schools would be good initiatives. As MG Foley points out:

> In Vietnam, armor officers often found themselves in the position of S3 of a light infantry battalion. Cross fertilization is worth the effort and we need to do it now, during peacetime.[132]

Yet another opportunity is in our Tactical Commanders Development Course (TCDC) taught at Leavenworth. Light force commanders go through a mixed-forces scenario, but heavy commanders go through a separate track without integration. This is another de facto doctrine of separation.

Finally, we need to look beyond the officer tier to how we can ensure integration of forces in our non commissi officer development courses.

CONCLUSION

> Units and headquarters that will fight together in teams, task forces, or larger units should train together routinely.
>
> FM 100-5

Mixed-force operations are a viable concept. Non-mechanized forces comprise over one-third of the active component force and more than 50% of the future contingency corps. There are some 40 active non-mechanized battalions in CONUS and five non-mechanized divisions in our reserve structure. Whenever we can bring these divergent forces together, everyone learns exponentially--especially commanders. The problem is the infrequency with which this joining occurs. The geographic separation of heavy and light units reduces the chance to conduct mixed-force training. The CFE restationing plan may offer an opportunity to gain some ground. Our schools and doctrinal manuals offer a partial solution, but there is no substitute for training.

Infantry may need armor more today than at any time since World War II. Consider the observation of General William E. Depuy:

> Spaced, laminated and even more exotic concepts for armor protection have reached a point where many of the smaller anti-armor weapons have been rendered largely ineffective, at least against the frontal armor turrets of the most modern tanks. This fact has profound implications for light infantry which is so heavily dependent on those same smaller weapons, and our new anti-tank weapon, "AWSM," will weigh 45 pounds and is not yet fielded.[133]

On the other side, how infantry fights and why armor needs foot infantry, has not radically changed since World War II. COL James Dyson was asked to envision the employment of foot infantry with armor today, after the advent of the Bradley and Cavalry Fighting Vehicles:

> Well, threat artillery is more versatile and weapons more lethal. But I don't think that much has changed in principle. The infantry cannot effectively fight out of a fighting vehicle. They can't see enemy infantry any more than a tank can that way. You need infantry to keep the enemy away from the tank. The Panzer Faust was as much a threat then as the Sagger is today.[134]

The need for training to achieve close integration of tank and infantry (mixed-force operations) is greatest in our future "contingency corps." Whether you consider the tank preeminent and infantry's function to restore lost mobility to the tank, or the tank an infantry support weapon, successful operations require the two be employed together. If the decision is to employ light forces in universal terrain against a heavy enemy, especially in the desert, then beefing up is in fact required if the force is to have any utility at all.

LTC Jim Montano of the 7th ID wrote that the mission of the light division is "when properly augmented, (to) fight and win in a mid to high intensity conflict."[135] History and current NTC experience suggest that might be more accurately restated: "When properly augmented and trained with habitually associated heavy forces, (to) fight and win in a mid to high intensity conflict."

General Burba subscribes to the need to mix forces across the spectrum of conflict:

> Our Desert Shield and NTC experiences verify that heavy forces predominate in open terrain where light units execute complementary missions. In addition, we would need armor and mechanized forces augmented with light or dismounted infantry to deal with a heavy enemy force in mixed or restrictive terrain. We can conclude, therefore, that under most circumstances our contingency forces should comprise a mixture of heavy and light units.[136]

But is this insight being operationalized? On 27 February 1990, the U.S. Army Armor School hosted a conference to gain an appreciation for how non-mechanized infantry divisions visualized the employment of armor and the extent to which significant tank-infantry training was occurring in the force. BG Taylor, Assistant Commandant of the Armor School and Center, was present for all sessions, and MG Foley was outbriefed after three days. The 2nd Infantry Division was not represented. It was the consensus that while the occasional Reforger may include a light battalion, there is generally no real mixed-force training going on other than at the NTC (with some notable exceptions such as 4th ID Mechanized and 6th ID Light at Pinon Canyon Maneuver Site in preparation for the 1st Brigade, 4th ID, NTC rotation in 1990) and the annual Team Spirit in Korea.

The most important recommendation which emerged, therefore, was that all rotations to training centers include mixed-force operations. It was outbriefed that while the obstacles of geographical separation of forces and constrained dollars remain, <u>this single proposal, if adopted, would provide an impetus to units to train</u>.[137]

Even in our heavy divisions the level of training of combined arms with dismounted infantry is not a "T" for trained. It is at best a "P" (practice), if not a "U" (untrained). Tankers have so organized their gunnery programs with TCQC, Tables I-VII, Table VIII, Tables IX-XII, and wing man drills that there is virtually no time left for training with dismounted infantry, and Bradley gunnery exacerbates it on the infantry side.

What would a light brigade in a mid-intensity conflict look like once it had sufficient augmentation of armor, combat support and "plugs" of combat service support? It might not be too different in appearance than a Marine Amphibious Brigade (MAB). A MAB has organic armor, a light armored vehicle company, a reconnaissance company, anti-armor, and an engineer company. Most important, it has a brigade service support group (BSSG) with 30 days of supply.[138] I am not a great advocate of the "light armor regiment,"[139] but I am absolutely convinced of the combat advantage any armor element would bring simply because it would be organic to the division and afford the chance to train.

Obviously, as we build down we are not going to restructure the Army and create separate tank battalions; but why is that such an abhorrent thought? Is it a branch paradigm born of 30 years of separation? Is it a de facto doctrine? It certainly does not contradict the World War II experience. So if we do not restructure, that leaves doctrine, leader development, and training as the venues to address the problem. Our manuals and the curriculum of our schools are important. However, the

techniques that save lives emerge only when the units are mixed and maneuver together. The FORSCOM Exercise Schedule and the FORSCOM Commanders Training Guidance are "the vehicles" to make it happen!

Addressing the direction for FORSCOM, General Burba wrote, "We must continue to create and train tailored light-heavy and heavy-light organizations on a regular basis."[140] In point of fact, however, it has not happened with anything like regularity. In the last two years at the NTC, of 28 rotations only 8 were heavy-light and one was light-heavy. A significant volume of literature has been published on heavy-light operations, the capabilities and limitations of the respective forces, and the potential to employ them together in various theaters of operation. There is, however, very little being written about actual maneuver experiences because it simply is not happening. If the reason we do not train our tank and non-mechanized soldiers together is that we believe there is operationally no role for foot infantry, then we have forgotten our history. If we believe that there is a role, that foot infantry will remain a significant part of the force structure, and that combined arms is in fact the way we will fight, then let's train together, and let's do it now.

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Appendix 2 - Recommended TO&E, Tank Regiment, Infantry Division, 1 December 1945
Appendix 3 - TO&E, Infantry Division, "Triangular" Korean War

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Appendix 2 - Dr. C. P. Roland, Major, U.S. Army (Ret.), 99th Infantry Division

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ANNEX G - Doctrine

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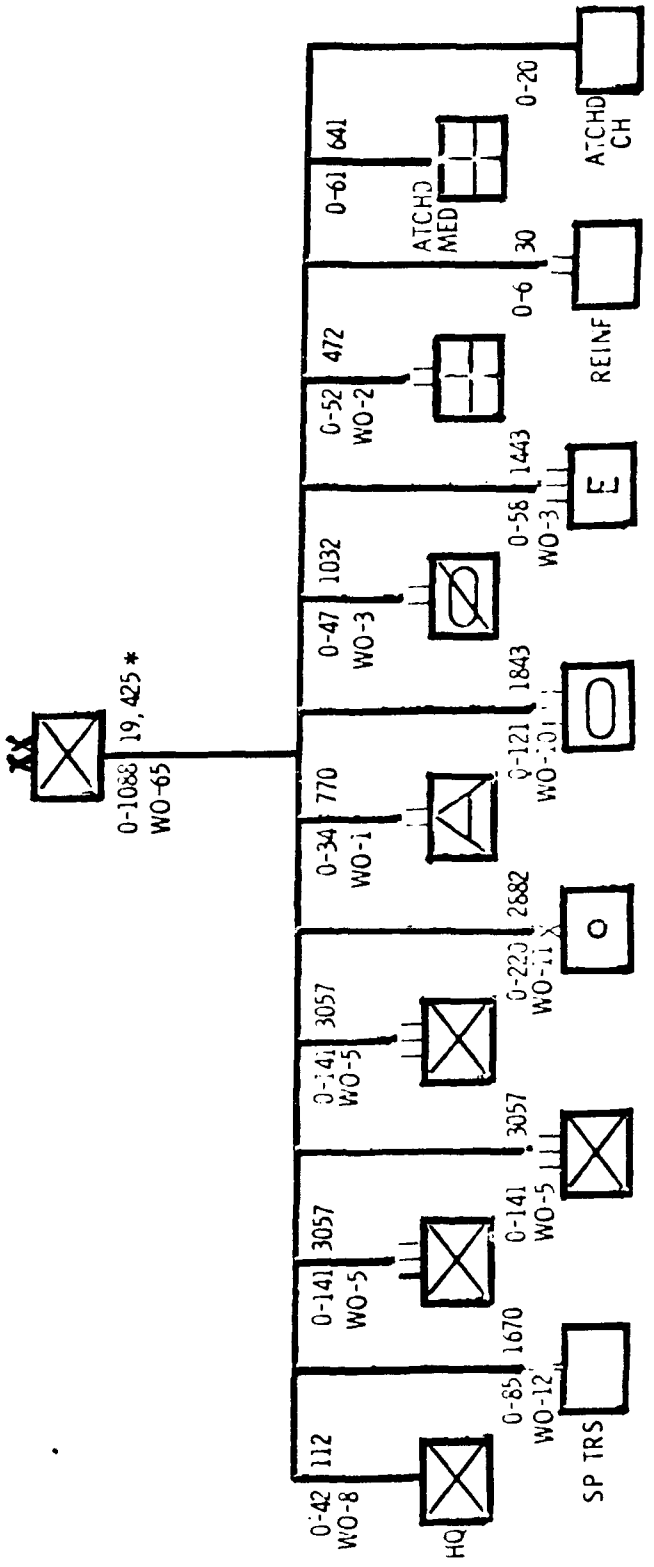
Annex A, Appendix 1
Recommended TO&E of Tank Regiment,
Infantry Division, 1 Dec 1945

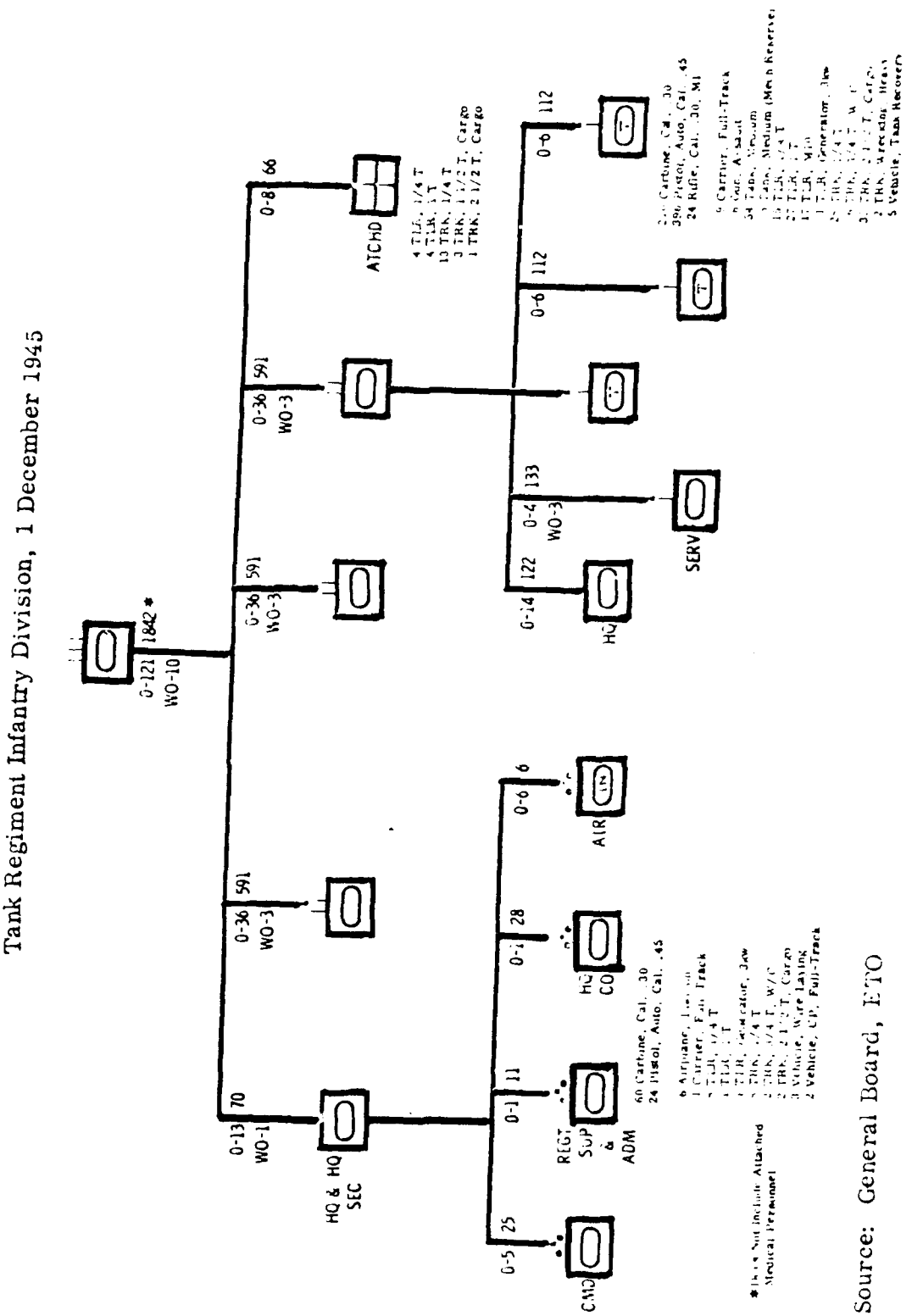
Recommended Organization, Strength, and Equipment of Infantry Division, 1 December 1945



*Does Not Include Attached Medical Personnel

Source: General Board, ETO

Annex A, Appendix 2
Recommended TO&E of Tank Regiment,
Infantry Division, 1 Dec 1945



CORG-M-365

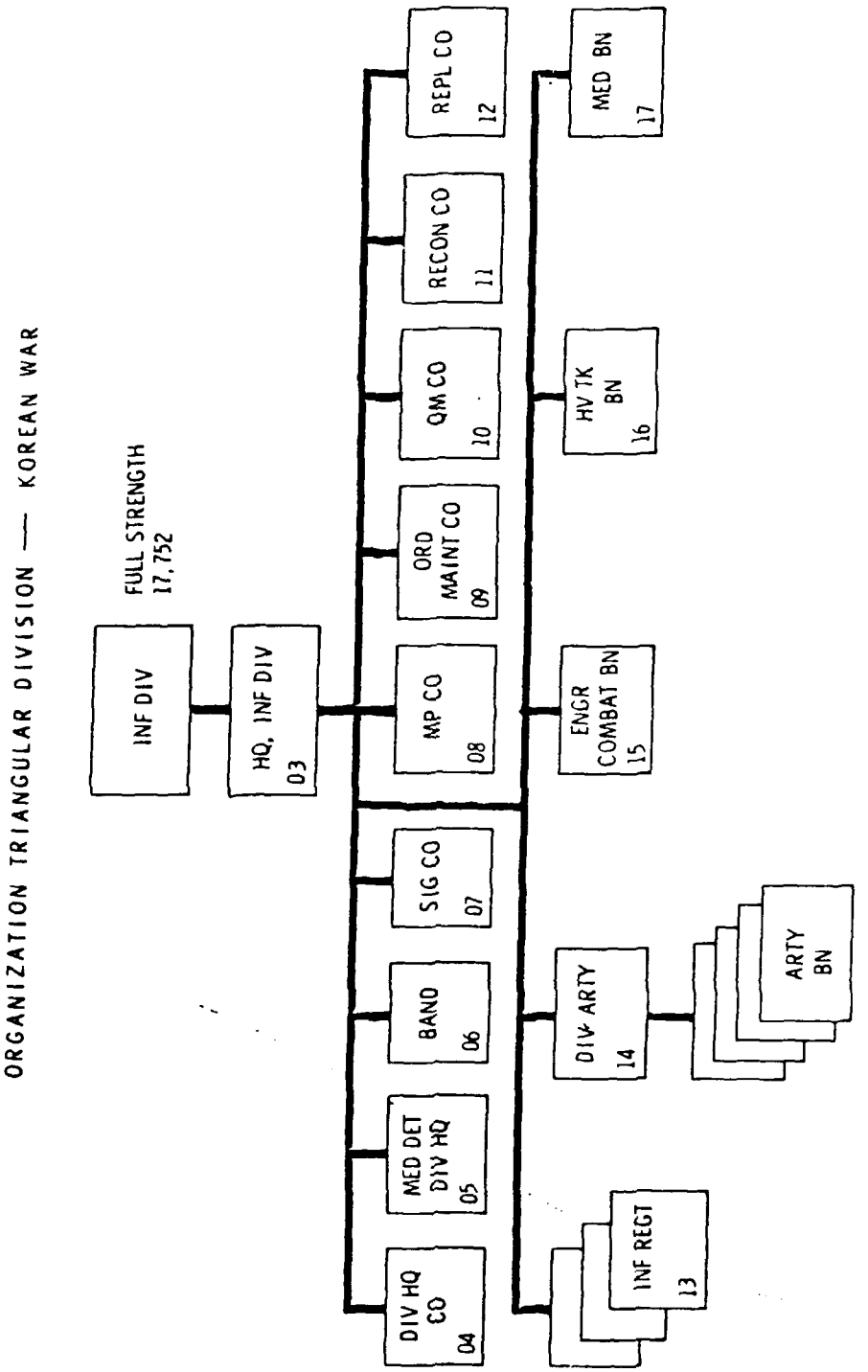


Figure 11. Organization of the Triangular Division, Korean War

Source: Ney, Virgil, Evolution of U.S. Army Division 1939-1968. CORG-M-365. Combat Operations Research Group Memo. CORG-M-365. Fort Belvoir, VA: Combat Dev. Cmd., 1969.

ANNEX B
THE WORLD WAR II VERDICT

The Italian Campaign	"The infantry had not moved fifty feet before a man was blown up by a mine (anti-personnel). By the time the Infantry had moved 300 yards, followed by the two tanks, four more men had been injured by mines . . . the tanks then led the way and by picking infantry avenues of approach were able to assist the infantry by running over the anti-personnel mines and clearing a path . . . the infantry followed in the tracks."[141]
The Anzio Beachhead	"You cannot let tanks pass over your infantry. The Germans follow their tanks so closely that men cannot crouch in their foxholes, let the tanks pass over, and then get up and fight the German infantry. They are shot or bayoneted while still crouched in their foxholes. (You must have armor.)"[142]
In the Reductions of METZ	"Infantrymen and tankers had extreme confidence in one-another and knew each other's capabilities. One would not advance without the other. This was the direct result of prior training and use. The success of the operation indicates that all troops should include tank-infantry exercises in unit training in order to afford small unit tank and infantry commanders an opportunity to become familiar with tank-infantry operations."[143]
In the Reduction of METZ	"In the fighting for METZ in World War II, the 735th Tank Battalion was employed in a manner which violated all the tenets of armored doctrine. (Terrain precluded the employment of armor as a weapon of mass and mobility.) The 735th was a separate tank battalion and during the reduction of METZ were accompanied in several battles by 5th Infantry Division soldiers riding on the tanks to contact, in some by preceding the infantry, at other times by moving in conjunction with the infantry, and on occasion by supporting fire from the flank."[144]

The Hurtgen Forest

"Unsupported infantry attacks lacked shock effect. Even at the lowest level it took combined arms. As an example, in the Hurtgen Forest in reducing a single pillbox, "Company E, 39th Infantry, used a TD and a tank to fire at the openings, a squad of infantry, a half squad of engineers using poling charges and a squad of flame throwers and white phosphorous smoke."[145]

"The final effort of the 9th Division in the Hurtgen Forest was the attack of the 39th and 60th Regiments on Germeter in October 1944. The advance to contact was made with tank-mounted infantry. 1st Platoon, Company C, 746th Tank Battalion led the 1st Battalion, 39th Infantry, with infantry mounted until they received anti-tank gunfire. The 3d Battalion, 39th Infantry, transported two companies on five tanks and four tank destroyers. B Company, 1st Battalion, 47th Infantry, moved the same way."[146]

In the Reichswald Forest

The rules and principles of cooperation were adopted to suit the limited visibility and restricted maneuver:

"Infantry preceded the tanks in all advances, moving 30 yards ahead to avoid falling trees. Masked lighting was used at night. The infantry advanced yards at a time and signaled with red flash-lights. Tank and infantry commanders kept close together. Each infantry company wore some distinguishing mark and the infantry provided flank protection day and night."[147]

On Makin

LTC John F. McDonough, Commander, 2nd Battalion, 165th Infantry, reported that on 21 December 1943, following the assault on Makin in the Central Pacific, "it took us the better part of a day to make them (the tanks) understand just how we wanted them to work," which involved "going up to each tank individually, right on the front line, and telling them what you wanted done. . . . When this was straightened out, the tanks contributed greatly to the accomplishment of the mission."[148]

On Saipan

"The 27th Infantry Division as part of V Corps was clearing the northern neck of Saipan on 6 July 1944 and was unable to advance due to its inability to integrate tank and infantry assets. The 105th Regiment, organic to the 27th, had requested tank support on 5 July but no tanks arrived when the attack began on 6 July. When two platoons of tanks arrived, they were unable to find anyone who could direct them to the command post of the 3d Battalion, 105th Infantry. On linking up with Company L, one tank platoon drove into Harakiri Gulch without infantry. The third tank was disabled by enemy infantry with magnetic mines. The tanks withdrew and no further advance was attempted. In the 2nd Battalion, 105th Infantry, sector an infantry commander made no attempt to maneuver using the fire support of the tanks and as the tank radio was not working, the tanks were unable to talk to the infantry. At nightfall the tanks withdrew to a service park. On the morning of 7 July the 105th Infantry regiment lost over 900 casualties out of 1,100 assigned. The 27th Division was relieved from the front. Prior to Saipan the division reported it had conducted tank infantry training in the Marianas and that both tank and infantry had learned the value of mutual support, protection, and communications."[149]

Market Garden

For examples of German employment of combined arms we can look to Market Garden, September 1944, when self propelled guns stopped the 82nd 400 yards short at the Nijmegen Bridge. At Arnheim, one battalion and one company of the British division reached the bridge but were halted by attacks strongly supported by armor and were virtually annihilated. Four battalions were reduced to 200 men for the lack of a substantial U.S. anti-tank capability and a timely link up with the heavy force.

The Bottom Line

"So long as it was possible to keep the same tank battalion and infantry division together and so long as commander casualties permitted the same unit commanders to work together, the understanding and team play increased rapidly. When it became necessary to shift a given tank battalion to the support of another division, or when cooperating unit commanders became casualties, much of this understanding and teamplay was lost and a new combination had to start from scratch."[150]

ANNEX C
APPENDIX 1
INFANTRY-TANK COOPERATION

The tank-infantry (foot) team was a subject often addressed in 1945 in journals, reports, and even letters to the editor:

To the Editors of The Infantry Journal:

> There is no question but what the outstanding lesson of this war, tactically speaking of course, is the fact that infantry must have tank support, and that tanks cannot operate without infantry.
>
> As a former member of the Armored Force staff and for the past year and a half as chief of the armored section of an army group, I have tried to do everything possible to implement the infantry-tank team. This was not so hard to do in armored divisions, for the tanks of such a division, the artillery, and the armored infantry were built into a compact team from scratch. But it was very hard for a while to put over the necessity for tank support of the infantry division by the separate tank battalions.
>
> But this condition changed. The selling period is over. The infantry wants and demands tank support. All armored division commanders have been asking for more infantry for their divisions.
>
> It is not impossible that our postwar army will see the infantry division with at least one and possibly two tank battalions as an organic part of the division. The results of battle have certainly shown this to be highly desirable.
>
> COLONEL.

* Maybe something like that will happen sooner.

Source: Editor, The Infantry Journal, August 1945, Washington, D.C., p. 62.

ANNEX C
APPENDIX 2
INFANTRY-TANK ATTACK CHECKLIST

Here is a simple matrixed checklist devised by the 9th Infantry in European combat in 1945:

INFANTRY-TANK ATTACK—*Check List for Unit Commanders*

DO YOU KNOW THE ANSWERS TO THE THREE BIG QUESTIONS ——	REMEMBER THESE POINTS	CAN YOU ANSWER THESE?	NOW CAN YOU ANSWER THE BIG THREE?	ESSENTIAL ELEMENTS OF TANK SUCCESS
(1) WHERE MUST THE TANKS GO?	(1) Most effective execution results from the sudden appearance of tanks in the enemy rear areas, CP installations, artillery positions, infantry in the open, and at close MG and cannon range. (2) If conditions are unfavorable for the above, tanks can support by: ▸ MG fire up to 500 yards ▸ Cannon fire up to visibility, and ▸ Indirect fire up to 7,000 yards. (3) Tanks do not have to be with the infantry to support by fire.	(1) What is our infantry-artillery plan? (2) Where is the enemy? (3) What are targets for tanks? (4) From what positions or routes of approach could tanks make most effective use of their fire power against these targets? (5) What alternate positions or routes of approach could tanks use and still render some support?	(1) Infantry commander determines where he wants tank fire placed. (2) Tank commander determines if it is possible to place tank fire where the infantry requests. (3) Tank commander determines where the tanks must go.	(1) Tankers must know what the infantry wants them to do. (2) Infantry must know what the tanks can and cannot do. (3) A mutual understanding, an attitude of full coöperation must exist between both. (4) Enough time must be allowed to properly mount the attack. (5) A skillful, vigorous, and determined execution by all.
(2) WHEN MUST THE TANKS BE THERE?	(1) Timing is the principal factor in coördinating the attack of the tanks with the Infantry-Artillery plan. It should give both the infantry and armor the fullest advantage of friendly artillery. (2) Proper timing is essential for surprise. (3) Do not neglect physical time and space factors. Sometimes it may be impossible for tanks to provide support.	(1) What are the time factors in the infantry plan? (2) In the artillery plan? (3) In plans of adjacent units? (4) How will the need for infantry protection for tanks affect the timing? (5) Can time be used so as to gain surprise?	(1) Infantry-Artillery-Tank commanders confer. (2) Infantry commander determines when tank support is desired. (3) Tank commander decides whether time space factors permit.	
(3) HOW CAN THE TANKS GET THERE WITH MINIMUM LOSSES?	(1) Tank enemies are: impassable terrain, high-velocity, direct-fire guns, mines, and infantry AT weapons. (2) Getting tanks into favorable support positions will probably mean dealing with one or more of these tank enemies. (3) Tanks moving into support positions require the greatest assistance and coöperation from other arms. Help them and they will help you. (4) A knocked-out tank in an otherwise favorable firing position can render no support.	(1) In getting tanks to support positions without losses, can you use any of the following: ▸ Covered routes ▸ Smoke, darkness ▸ Fire, movement, and overwatching by tanks. ▸ Air, ground, map, and photo reconnaissance ▸ Artillery protection ▸ Infantry protection ▸ Engineer assistance ▸ Alternate routes and positions (2) Has sufficient time been allowed for the reconnaissance and selection of routes and positions, and to physically execute the move?	(1) Infantry-Artillery-Engineers, determine how they can assist tank advance. (2) Tank commander determines routes and positions. (3) Effective tank support has begun.	

Source: Editor, The Infantry Journal, "Tanks and Doughboys," Washington, D.C.: July 1945, p. 10.

ANNEX C
APPENDIX 3
TANK-INFANTRY COOPERATION

A tank goes forward in action on Bougainville, Pacific Theater. Infantrymen follow in its cover. Soldiers are relying on the tanks' suppression and fighting as a team. March 1944.

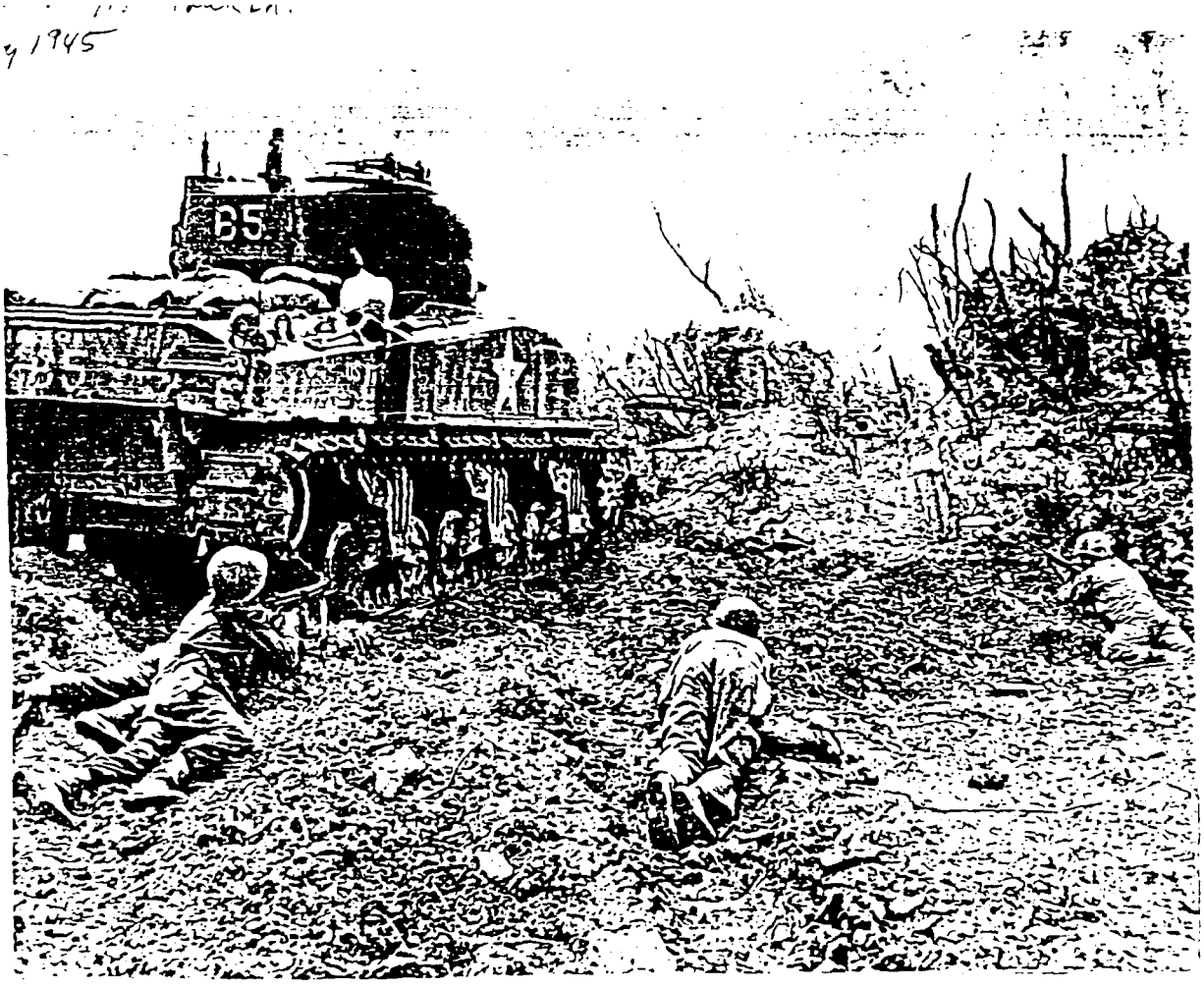
Source: U.S. Army Signal Corps, 189099-S, Action Series Collection, U.S. Army Military History Institute, Carlisle Barracks, PA.

ANNEX C
APPENDIX 4
INFANTRY-TANK COOPERATION

On the Move, France 1944

Source: Editor, Infantry Journal, "Tanks and Doughboys," Washington, D.C., July 1945, p. 8.

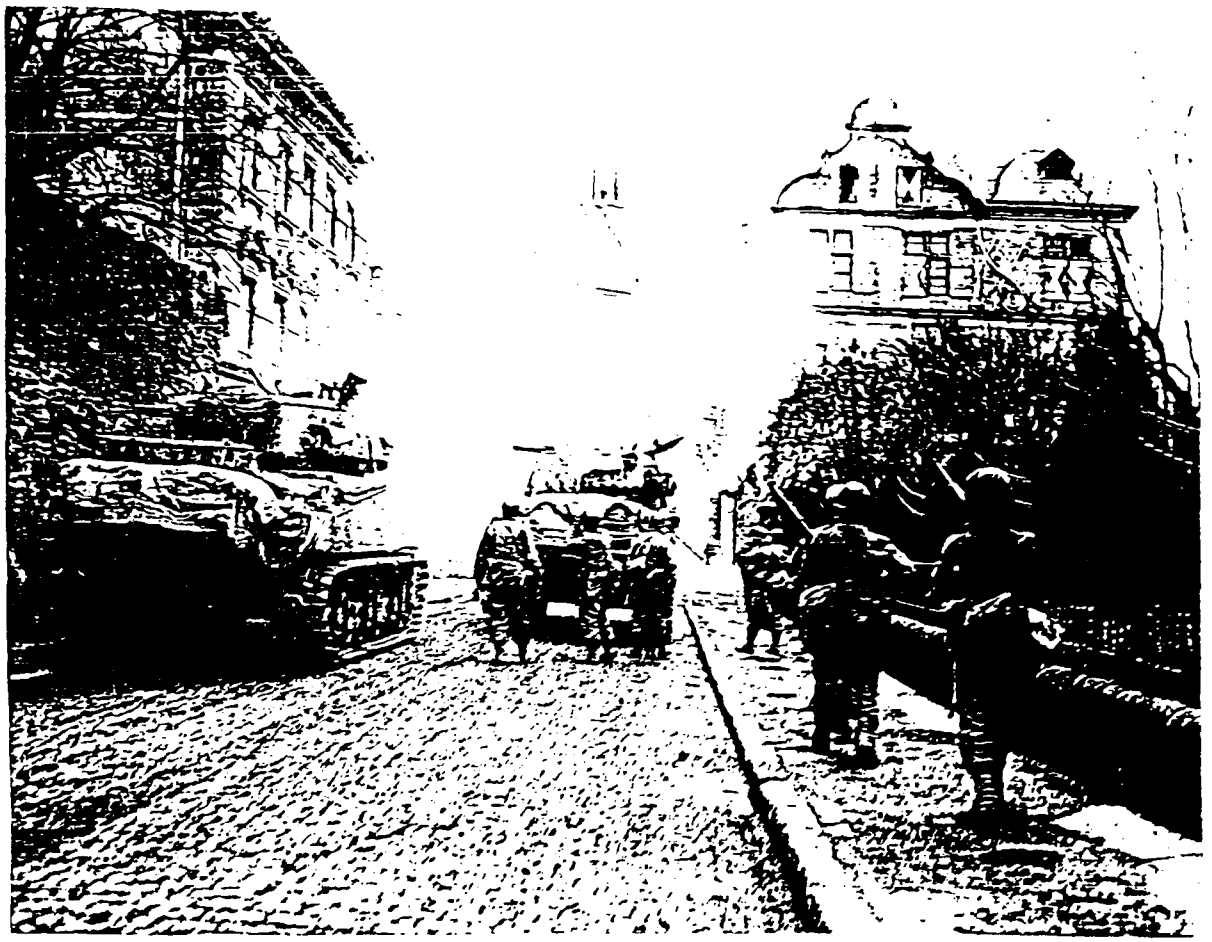
ANNEX C
APPENDIX 5
TANK-INFANTRY COOPERATION



Infantry assault with an M4 flame-throwing tank of the 718th Flame-Throwing Tank Battalion, Okinawa, 17 May 1945.

Source: U.S. Army Signal Corps, PFC Adams, Action Series Collection, U.S. Army Military History Institute, Carlisle Barracks, PA.

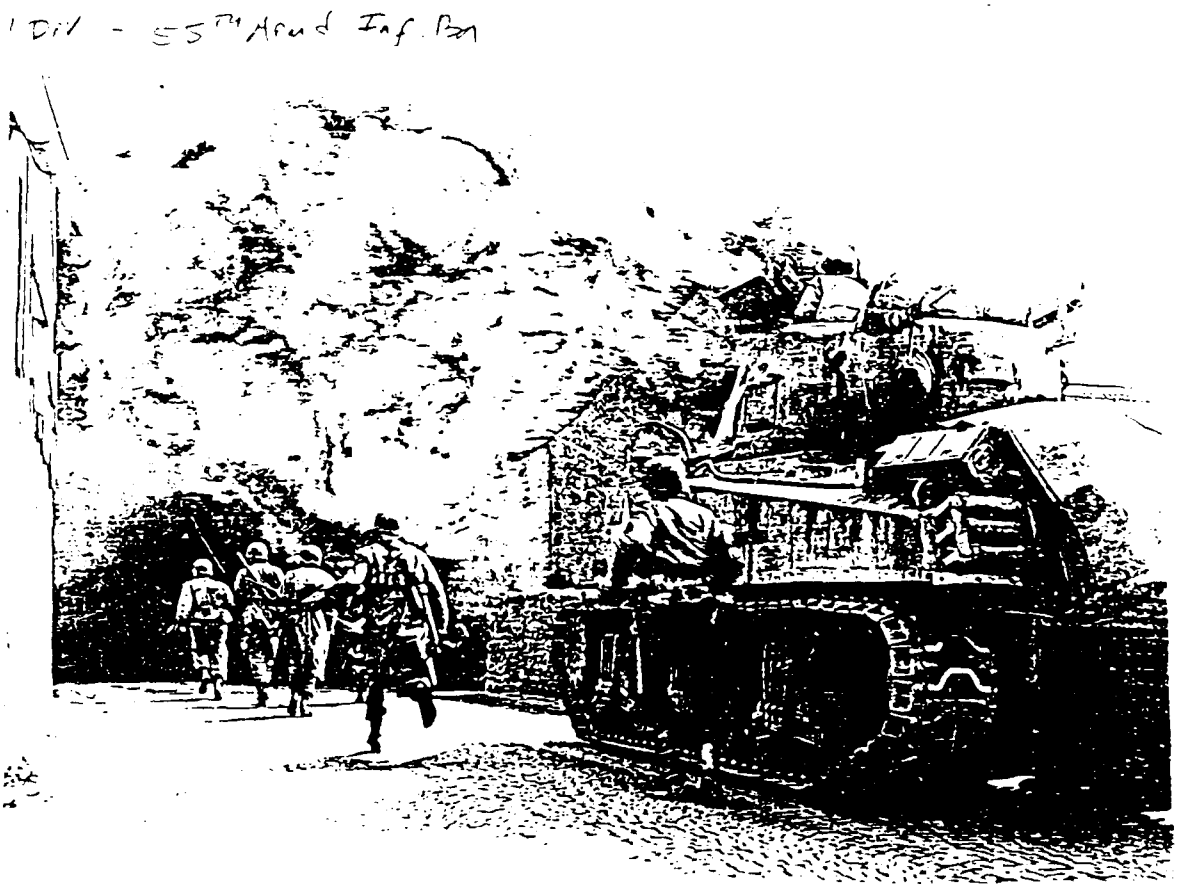
ANNEX B
APPENDIX 6
TANK-INFANTRY COOPERATION



Infantry-Armor assault into Andernach, Germany. A sniper has been located upper left.
Note: MOUT facilities constructed in CONUS in the last 10 years will not support the weight of armor (e.g. Fort Bragg, NC).

Source Photo: U.S. Army Signal Corps 202333, Photographer CPT R. F. Downs, Action Series Collection, U.S. Army Military History Institute, Carlisle Barracks, PA.

ANNEX C
APPENDIX 7
TANK-INFANTRY COOPERATION



Soldiers of 55th Infantry Regiment and 22nd Tank Battalion move through smokefilled streets of Wernberg, Germany, 22 April 1945, with U.S. Third Army.

Source: U.S. Army Signal Corps 205298, Action Series Collection, 11th Armored Division, U.S. Army Military History Institute, Carlisle Barracks, PA.

ANNEX C
APPENDIX 8
TANK-INFANTRY COOPERATION

Infantry and armor of CCB, 6th Armored Division, advance into Oberdorla, Germany.

Source: ETO HQ 45 30293 4 April, U.S. Army Signal Corps, Photographer PVT T. R. Romero, 166 William J. Givens Collection, Military History Institute, Carlisle Barracks, PA.

ANNEX D

APPENDIX 1

INTERVIEW, COLONEL JAMES H. DYSON

COL James H. Dyson (Ret.) served as Chief of Staff, 2nd Field Force, Republic of Vietnam. In his 31-year career he commanded two batteries, two battalions, and two artillery groups, one in Vietnam. In World War II he served with the 2nd Armored Division and witnessed the evolution of the modern combined arms team. COL Dyson, as an historical note, wrote significant sections of the National Defense Act of 1947. He taught at the Army War College in the early 1960's, and he now resides in Beaufort, South Carolina. This interview was conducted at Beaufort on 22 December 1990.

Q: What was your experience in the integration of tank and infantry in World War II?

A: "I served with the 2nd Armored Division from Fort Benning to Berlin. I commanded Battery A/14th Field Artillery Battalion. We were the first troops in Berlin. The division had 18,000 men on the ground. We were just an unstoppable force."

Q: Can you cite a battle example of foot infantry and armor which you personally witnessed?

A: "Yes. CCA, 2nd Armored Division, was trying to get through at St. Lo on the St. Lo to Paris Road. The U.S. Air Force (Army Air Corps) bombed the 30th or 31st Division (American), which had been leading, until it was combat ineffective. You can just imagine what CNN would do with that today. The 4th Battalion 22nd Infantry (foot) was attached by combat command "A" (CCA) to

the 66th Tank Regiment and given the mission to take the lead and break through. I was with the 66th as a forward observer. Our commander believed battery commanders were the best forward observers. We attacked at night with the infantry riding the tanks. The Infantry were trying to protect the tanks.

"I was with the lead tank company commander and had my head out so I could see. The Infantry were shooting down off t tanks and even bayonetting the German infantry as we crosse through hedges and bomb craters. We were able to break thro expand the break, and let General Patton's army come through.

"I will tell you that there was great effort expended in establishing the tank-infantry team. We had to have each other."

Q: To what extent was the mixing of non-mechanized or standard infantry regiments with armor common to the overall theater of operations?

A: "It was common practice to attach straight leg infantry to armored units. They rode and/or walked. It was tough on the Infantry, but it worked well. It has to be that way. We never fought without straight leg infantry."

Q: Today we have evolved from armored infantry to M113's, to the Infantry Fighting Vehicle, but we have five non-mechanized divisions in the force structure. Can you help me envision their employment today?

A: "Well, threat artillery is more versatile and weapons more lethal. But I don't think that much has changed in principle. The infantry cannot effectively fight out of a fighting vehicle. They can't see enemy infantry any more than a tank can that way.

You need infantry to keep the enemy away from the tank. The panzer faust was as much a threat then as the Sagger is today. The Russians always had infantry all over their tanks, as did the Germans. There was a squad to a platoon of infantry with the Tigers. They would ride, jump down and stay close."

Q: How important was the phone on the tank? We don't have a phone on the new main battle tank.

A: "Well, as soon as you get in a heavy fight, I'll tell you what you'll do. You'll be running field-expedient phones up onto the tank and into the turret. You can't be crawling up on the tank's deck once under fire. That doesn't work."

Q: We have seen some heavy brigade commanders at the NTC who expressed concern about using foot infantry on the objective at night ahead of the main heavy force assault. The concern is that the infantry on the objective or the barriers would preclude the heavy brigade commander from massing his artillery fire in support of his final assault. Can you give some insight to this perceived problem?

A: "We would send forward observers with engineers to control and clear fires on the obstacles. I believe the observers with the infantry could do the same thing in the situation you describe. In World War II we had spotter planes in the Artillery. They were gone when I deployed a group to Vietnam. Infantry certainly has to dig in and be quick about it. The Russians were great artillerymen. They learned from us. As a forward observer I could put in as much as 30 battalions of artillery on a target. I once directed a corps "time on target"

on a German infantry regiment that I observed digging in on a forward slope. There were few survivors."

Q: What about transport for the Infantry?

A: "Well, they had some trucks, but they usually paired up with us before the SP and rode the tanks when they were attached."

ANNEX D

APPENDIX 2

INTERVIEW, DR. C. P. ROLAND

Dr. C. P. Roland served with the 99th Infantry Division.

Q: What experience did you have with armor before the war?

A: "At that start of the war, we had no training with tanks. I had never been on one. I was a platoon leader, a rifle company commander, and deployed to Europe as a battalion S3. On maneuver in Louisiana we had tanks attached. I remember particularly the integration of this in defense of the Sabine River (border of Texas/Louisiana). We were on the Texas side. Opponents got a bridgehead across. We held tanks and infantry in reserve and made a combined infantry and tank attack and destroyed the bridgehead."

Q: What about tank destroyers?

A: "There was little difference between a tank and a tank destroyer. We used the tank destroyer with 90mm as support weapons like the Germans did with 88's. We were pinned in a ditch in the Remagen Bridgehead and were saved by a tank destroyer."

Q: What experience did you have with armored infantry?

A: "An officer came to our command post and said, 'We're supposed to move through your lines at 0600.' I said, 'What's your objective?' He pulled out this little map at a scale of 50 miles (we were used to these huge maps with low scales). They had infantry on their tanks. Of course, the armored division had organic infantry and they rode on tanks as well."

Q: What was the mobility at battalion level?

A: "According to my memory, each company had its 2-1/2 ton and jeeps. On two occasions I remember big moves. One was from Dormagen to Remagen, about 30 miles. We were about to have a big picnic, wine and cheese, a reception by the inhabitants of Dormagen. Orders came from Corps to move--a big truck convoy moved the division--ad hoc that night to Remagen. Corps directed that and furnished the transport.

"The second was when the breakout at Remagen occurred. We moved 30-40 miles to the forward side of the Ruhr pocket, northwest to force the Germans to surrender. Shuttle moves with the kitchen trucks (1 per company) were improvised."

Q: What observations could you offer on combined arms?

A: "Infantry alone cannot take any position--the automatic fire is too devastating. They have to have heavy mortar and artillery and get in position to call the fires. If the terrain permitted, we would get tanks or tank destroyers into position to support. Infantry drove off other infantry and let our armor pass. In the defense, if we could put enough fire on German tanks to run their infantry off, we could stop them. They did not like to move buttoned up and blind."

ANNEX E

DIVISIONAL ASSIGNMENT OF TANK BATTALIONS

DIV	TANK BN	DATES
1st Armd	1	1944-46
		1948-57
	4	1944-46
		1948-57
	13	1944-46
		1948-57
	100	1951-57
1st Cav	71	1949-50
	70	1951-57
1st Inf	63	1948-57
2d Armd	66	1946-57
	67	1946-57
	64	1949-50
	29	1950-57
	57	1950-57
2d Inf	72	1948-57
3d Armd	7	1947-57
	32	1947-57
	33	1947-57
	86	1948-53
	709	1953-57
3d Inf	73	1948
	751	1948
	73	1949-50
	64	1950-57
4th Armd	8	1943-46
	35	1943-46
		1953-57
	37	1943-46
	508	1953-57
	704	1953-57
4th Inf	40	1948-57
5th Armd	10	1943-57
	17	1943
	34	1943-57
	81	1943-62
	80	1948-57
5th Inf	85	1948-53
	759	1953-57
6th Armd	15	1943-45
		1950-57
	68	1943-45
		1950-57
	69	1943-45
		1950-57
	702	1945-50
	748	1945-50
	749	1945-50
	91	1950-57
6th Inf	92	1950-59
7th Armd	40	1943-45
	17	1943-present
	31	1943-present
	95	1950-58
	94	1950-62
7th Inf	77	1949-51
	73	1951-57
8th Armd	18	1943-present
	36	1943-present
	80	1943-45
	736	1945-53
	601	1953-present
	603	1953-present
8th Inf	41	1950-57
9th Armd	2	1943-51
	14	1943-51
	19	1943-51
	605	1953-present
	607	1953-present
	656	1953-present
	811	1953-present
9th Inf	61	1948-57
10th Armd	3	1943-51
	11	1943-51
	21	1943-51
	609	1953-present
	612	1953-present
	648	1953-present
	654	1953-present

Source: Sawicki, James A. Tank Battalions of the U.S. Army, 1944-1962, Wyvern Publications.

DIV	TANK BN	DATES
10th Inf	62	1948-57
11th Abn	76	1950-57
	710	1950-58
11th Armd	22	1943-45
	41	1943-45
	42	1943-45
	741	1953-present
	818	1953-present
	823	1953-present
12th Armd	23	1943-present
	43	1943-present
	714	1944-45
	706	1953-57
	827	1953-present
13th Armd	24	1943-52
	45	1943-52
	46	1943-52
	350	1949-52
	715	1953-present
	736	1953-present
	738	1953-present
14th Armd	48	1943-51
	25	1943-53
	47	1943-present
	691	1953-present
	725	1953-present
	821	1953-present
16th Armd	16	1943-53
	26	1943-53
	5	1943-63
18th Armd	28	1943
	30	1943-50
	29	1943-52
19th Armd	38	1943-52
	39	1943-52
	49	1943-52
20th Armd	9	1943-46
	20	1943-53
	27	1943-53

DIV	TANK BN	DATES
21st Armd	50	1943-52
	51	1943-52
	52	1943-52
	809	1949-52
22d Armd	53	1943-52
	54	1943-52
	55	1943-52
	308	1949-52
23d Inf	714	1954-56
24th Inf	78	1949-51
	6	1951-58
25th Inf	79	1949-51
	35	1951
	39	1951-57
26th Inf	26	1949-59
27th Armd	127	1955-59
	205	1955-59
	208	1955-59
	274	1955-59
27th Inf	127	1949-55
28th Inf	628	1949-55
29th Inf	197	1949-59
30th Armd	173	1954-59
	174	1954-59
	175	1954-59
	176	1954-59
30th Inf	130	1949-54
	130	1954-59
31st Inf	198	1949-59
32d Inf	132	1949-59
33d Inf	121	1949-54
	121	1954
	106	1954-59
34th Inf	195	1949-59

DIV	TANK BN	DATES
35th Inf	135	1949-59
36th Inf	136	1949-59
37th Inf	137	1949-59
38th Inf	138	1949-59
39th Inf	206	1949-59
40th Armd	133	1954-59
	134	1954-59
	139	1954-59
	140	1954-59
40th Inf	140	1949-54
41st Inf	803	1949-59
42d Inf	142	1949-50
	142	1950-59
43d Inf	143	1949-59
44th Inf	106	1949-54
45th Inf	245	1949-59
46th Inf	246	1949-59
47th Inf	194	1949-59
48th Armd	162	1955-59
	163	1955-59
	190	1955-59
	187	1955-59
48th Inf	190	1949-55
49th Armd	145	1946-52
	146	1946-52
	147	1946-52
	155	1952-59
	156	1952-59
	157	1952-59
	249	1949-59
49th Inf	149	1949-59

DIV	TANK BN	DATES
50th Armd	113	1946-59
	114	1946-59
	215	1946-59
	644	1946-59
51st Inf	263	1949-59
63d Inf	350	1952-59
69th Inf	893	1954-56
70th Inf	703	1952-59
71st Inf	723	1954-56
75th Inf	744	1952-present
76th Inf	376	1949-52
	740	1952-59
77th Inf	377	1949-52
	819	1952-59
78th Inf	378	1949-52
	766	1952-59
79th Inf	379	1949-52
	716	1952
	813	1952-59
80th Inf	610	1952-59
81st Inf	381	1949-52
	726	1952-59
82d Abn	714	1950-54
	44	1950-57
83d Inf	814	1949-52
	778	1952-54
84th Inf	808	1952-59
85th Inf	385	1949-52
	749	1952-59
87th Inf	387	1949-52
	812	1952-59
89th Inf	389	1949-59

DIV	TANK BN	DATES
90th Inf	351	1949-52
	737	1952-59
91st Int	391	1949-52
	767	1952-59
94th Inf	394	1949-52
	762	1952-59
95th Inf	395	1949-52
	735	1952-59
96th Inf	396	1949-52
	24	1952
98th Inf	398	1949-52
	817	1952-59
100th Abn	303	1950-52
	400	1950-52
100th Inf	824	1952-59
101st Abn	42	1950-57
	65	1950-57
102d Inf	402	1949-52
	705	1952-59
103d Inf	403	1949-52
	781	1952-59
104th Inf	324	1949-52
	718	1952-59
108th Inf	602	1952-59

ANNEX F
APPENDIX 1
TANK-MOUNTED INFANTRY

Soviet units cross the Manchurian border (probably 39th Army)

Source: Glantz, David M., LTC, August Storm: Soviet Tactical and Operational Combat in Manchuria, 1945. Leavenworth Papers No. 8, Fort Leavenworth, KS: Combat Studies Institute, June 1953, p. 17.

ANNEX F
APPENDIX 2
TANK-MOUNTED INFANTRY

HEADQUARTERS COMBAT COMMAND "A"
7TH ARMD DIV, APO 257, U S ARMY

9 February 1945

TRAINING MEMORANDUM
NUMBER.....7)

TANK-MOUNTED INFANTRY

I

SPECIAL INSTRUCTIONS

1. The following methods of employment of troops will be generally followed in future operations of this command. The cross country mobility, fire power, and protection of the tank will be employed to the maximum transporting the Infantrymen with the greatest degree of safety, across fire swept zones to a point where he can close, in the best possible physical condition with his opponent.

2. This Training Memorandum will be made the subject of special schools for Officers. It will be utilized in the instruction of all Non-commissioned Officers and soldiers of this command; in chalk-talks, in demonstrations on the ground, and in training and tests in the field.

3. Commanders will utilize these methods, or variations as required by circumstances, in battle.

II

PURPOSES

1. This command will normally operate in Infantry-Tank Task Forces, which will frequently employ Tank-Mounted Infantry Teams as striking forces.

2. Extensive use will be made of Tank-Mounted Infantry for the following reasons:

a. The Infantry can be carried rapidly, with the greatest degree of safety, and without fatigue, to assault range of the enemy. The riflemen on foot can, at best, average only one mile an hour. On a tank he is carried into the German defenses at five miles per hour.. Consequently he is exposed to enemy fire five times longer if he is on foot. Furthermore, lying behind the turret, he is absolutely safe from frontal fire, and less exposed to flanking fire than if he were on foot. (Note: German machine gunners seldom fire during a tank attack.) Lastly, he arrives at the enemy defenses fresh, rather than worn out by the exertions required in a normal advance on foot.

b. The tanks provide superior fire support during the advance. As soon as the attack is launched, all tank weapons are fired on all located or probable areas of resistance to:

(1) Thicken supporting artillery, morter, and fixed machine gun fires.

(2) Shot the enemy down and keep him down. By opening such fires at once, hostile antitank guns and tanks are "drawn" into firing at ineffective ranges, and enemy positions are prematurely revealed which may be silenced by concentrated fires from weapons of all caliber. Other supporting fires must lift, but tank fire continues after the Infantry dismounts to fight on foot.

Source: U.S. Army Ground Forces Observer Board, Report of Observers ETO 1944-45. Vol. V, AGF Rpt. No. 1120, Tactics, Organization and Equipment, 7th Armored Division Training Memo #7. Washington: Army Ground Forces, 9 February 1945, p. 1-7.

TM # 7 Hq, CCA (Cont'd)

c. The Infantry provides close security for the tank during the attack. While on the tank, riflemen facing the flanks and rear will immediately dispose of bazooka or grenade men. They are immediately available to start flanking operations against extensive antitank defenses or to push through and secure minefields. On winning an objective, they can promptly take over the defense and permit the tanks to seek defilade in support. The same men who ride the tank can provide its infantry outpost at night.

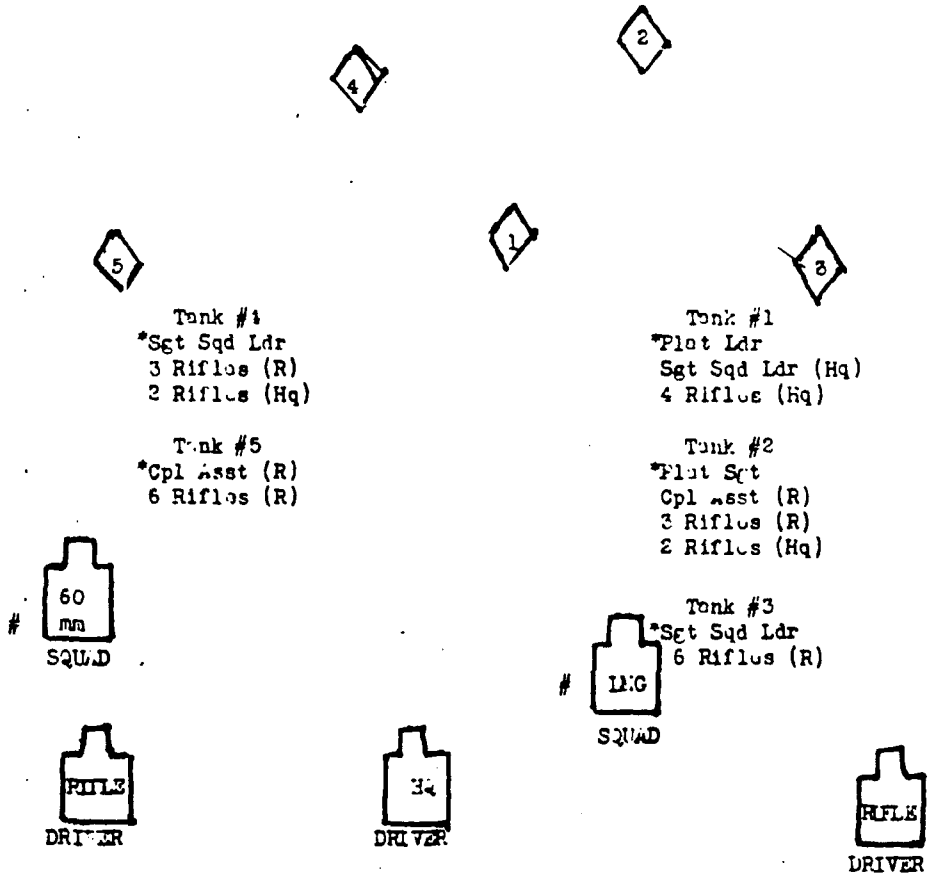
III

ORGANIZATION

1. The Infantry-Tank Team will normally be the Rifle Platoon transported by the Tank Platoon.

2. The Rifle Platoon may be transported by the following methods:

a. Riflemen in assault:

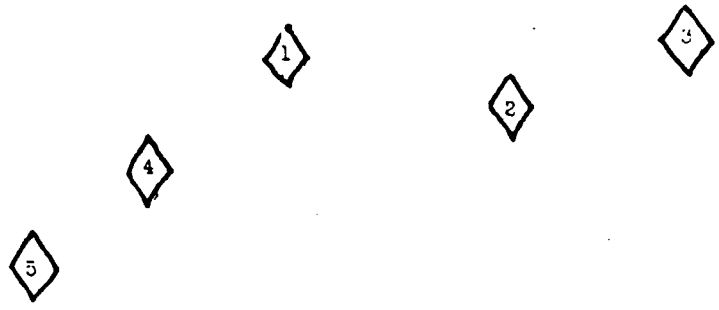


Remain under cover during attack. Move forward on order with squad equipment. May also carry bedding rolls of tank crews if rear decks of tanks must be cleared.

NOTE: * Leader lying in center can observe and talk to tank commander. Other men three to a side. One of the Infantrymen may man the 50 Caliber machine gun.

Form base of fire or follow attack to afford immediate support or quick organization of defense.

b. Light Machine Gunners and Riflemen in assault:



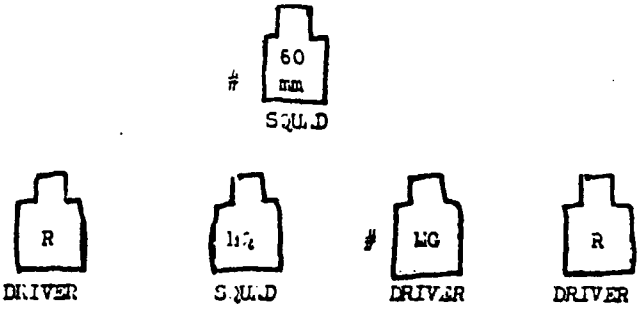
Tank #4
*Sgt Sqd Ldr (R)
3 Rifles (R)
Cpl Asst (LG)
1 Gunner (LG)
1 Carrier (LG)

Tank #5
*Cpl Asst (R)
6 Rifles (R)

Tank #1
*Plat Ldr
Sgt Sqd Ldr (LG)
5 Rifles (LG)

Tank #2
*Plat Sgt
Cpl Asst (R)
3 Rifles (R)
1 Gunner (LG)
1 Carrier (LG)

Tank #3
*Sgt Sqd Ldr (R)
6 Rifles (R)



Remain under cover during attack. Move forward on orders carrying bulky equipment of assault squads. May carry bedding rolls, tarp, or rations of tank crews if rear decks of tanks must be cleared.

NOTE: * Loader lying in center can observe and talk to tank commander. Other men three to a side. One of the Infantrymen may man the 50 caliber machine gun. Extra ammunition in quantity for the light machine guns may be carried inside the tank.
Form base of fire or follow attack for immediate support.

c. Half-tracks following Tanks in Assault.

In the event that terrain is favorable, Infantry may operate with tanks in approach march and assault as follows:

IV

OPERATIONS

1. During a rapid road march when opposition is possible but not probable, form the column of Tank and Infantry units alternating as follows:

a. Alternating by companies - Administrative march.

b. Alternating by platoons - when the terrain and tactical situation definitely prescribe that one type of weapon should be employed in the leading platoon.

c. Alternating by vehicles - in the normal situation, when the hostile situation is vague and the terrain unfamiliar. This formation lends itself to immediate combined attack or defense, mounted or dismounted. It affords the best mutual protection against surprise of any sort.

2. In moving through woods or villages, where tanks are vulnerable to hostile tank-hunting teams, have a halftrack follow each tank or mount riflemen on tank decks. By firing the 50 caliber machine guns and Infantry small arms to the flanks as covering fire, or by the very presence of the rifle troops, such defiles may be passed by tanks with little opposition.

3. The destruction of hostile skirmishers, the attack of earthworks in the open, or an attack of a target of opportunity, such as a mounted column, may be best accomplished by the Infantry riding in halftracks behind the Tanks. These halftracks afford a great deal of protection from small arms fire and shell splinters, as well as a rapid means of transportation. Vehicular weapons must be manned and firing. All other personnel must be kneeling on seat cushions, employing personal weapons on targets of opportunity or to thicken the covering fires.

4. The attack of a woods should be made with riflemen mounted on Tanks, the latter firing HE for tree bursts. Smoke may be fired by Tanks to blanket the antitank defense in the near edge of the woods. Riflemen should not dismount until on the hostile position, within the woods, unless the Tank is disabled. After the first hostile position is overrun, the advance is continued, generally in a line of platoon or section columns, with riflemen acting as advance guard, flankers, and rear guard.

5. In the attack of a small village, where it is expected that resistance will be weak, and a strong possibility of counterattack exists, riflemen and machine gunners should be mounted on Tanks. The attack should be launched perpendicular to the long axis of the village, so that the greatest number of houses are entered at the same time. Tanks should approach rapidly, firing HE and WP for destructive and smoke effect, each concentrating on eliminating any enemy in two adjacent predesignated houses to its front. On reaching one of these houses, it moves to a protected position where it can fire around one corner, and begins shelling the houses on the opposite side of the street. As soon as the Tank halts, the rifleman should dismount, throw grenades, and enter the house via the nearest opening - preferably a shell-hole. Machine gunners and tanks support the further attack of the riflemen, and are disposed without delay to break up probable counterattack. Other components of the rifle platoon move forward rapidly when fire is masked.

6. In attacking an extensive town or city, the primary requirement will be a mass of riflemen. Therefore, riflemen alone should be mounted on tanks. Other aspects of the attack are carried out as in the attack of a small village.

7. The attack of a strongly fortified position is a specialized operation in which Infantry mounted on Tanks cannot generally be employed to advantage.

8. In all cases where the Tank is stopped by terrain or hostile action, the transported Infantry will dismount, and proceed on the mission on foot.

TF # 7 Hq, CC.. (Cont'd)

NOTE: The above three Task Force Commanders have three separate problems, to be solved by three totally different uses of the Infantry-Tank Team.

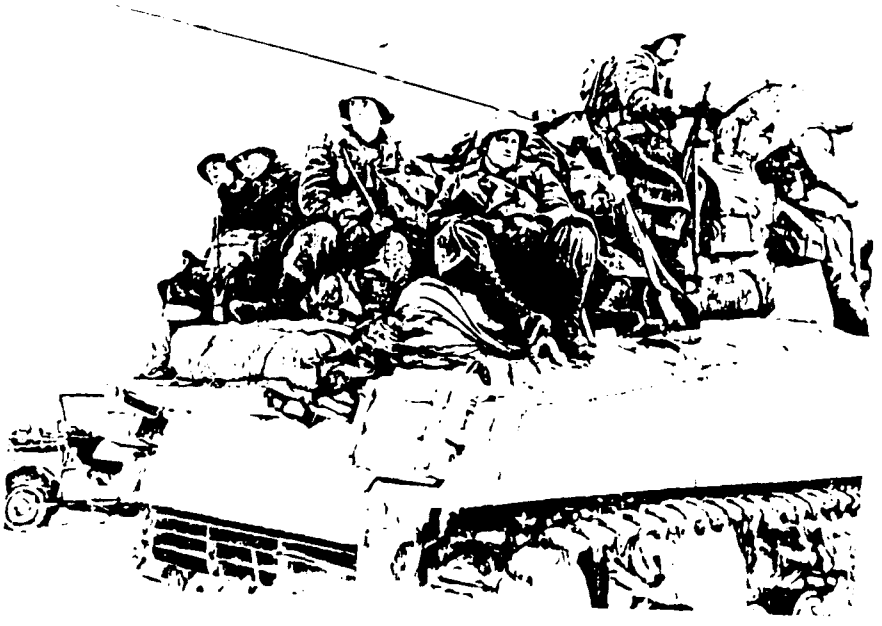
By order of Colonel TRIPLET:

/s/ Theodore T. King
/t/ THEODORE T. KING
Lt. Col, Inf,
Executive

OFFICIAL:

/s/ Leo C. Carlson
/t/ LEO C. CARLSON
Major, Cav,
S-3.

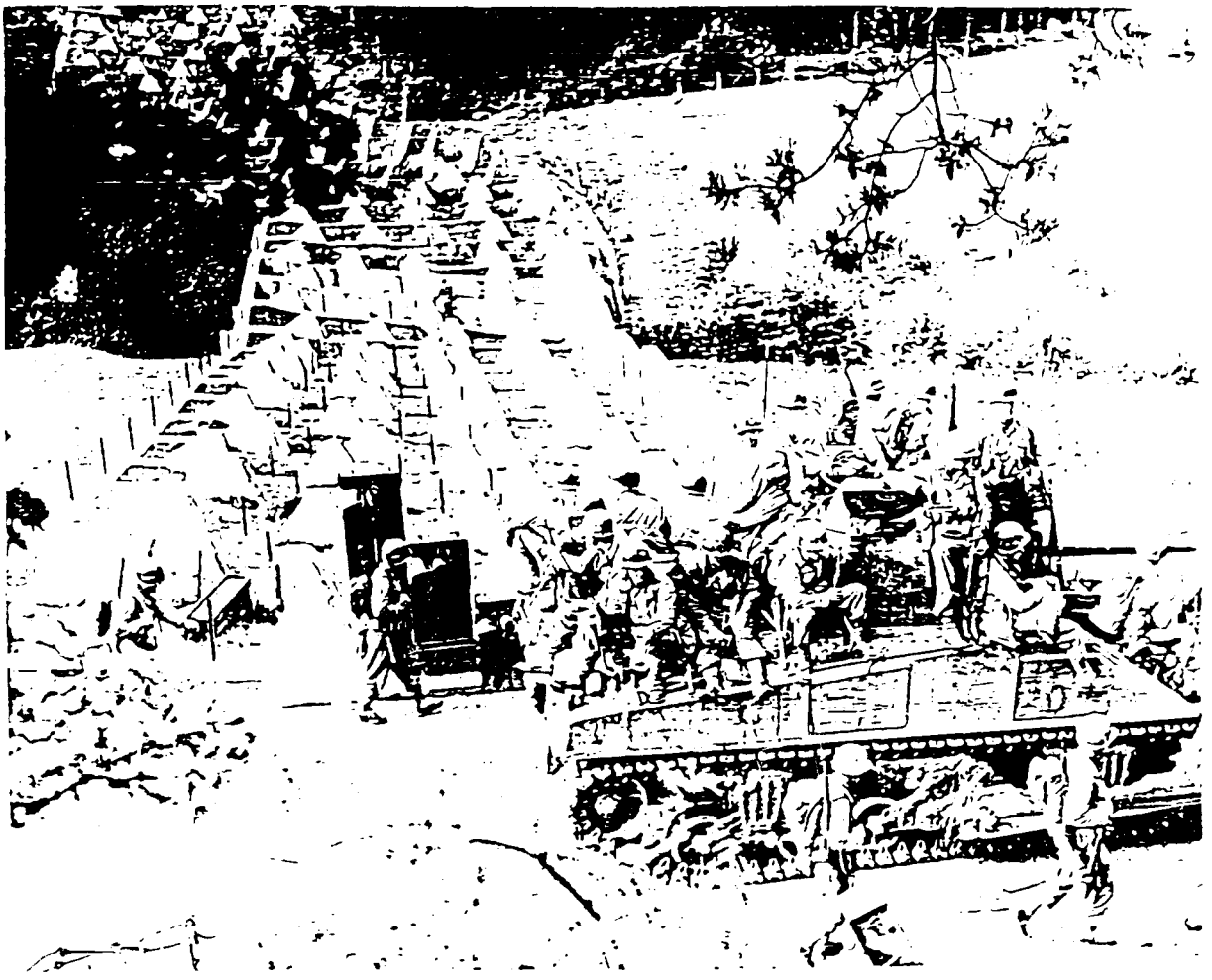
ANNEX F
APPENDIX 3
TANK-MOUNTED INFANTRY



Making themselves at home on top of this Medium Tank of the 68th Tank Battalion, 6th Armored Division, are members of the 134th Regiment, 35th Infantry Division, on their way to Luxembourg.

Source: ETO HQ 45, 10527, 26 January, U.S. Army Signal Corps, Photographer PFC Joseph W. Lapine, William J. Givens Collection, Military History Institute, Carlisle Barracks, PA.

ANNEX F
APPENDIX 4
TANK-MOUNTED INFANTRY



39th Infantry, 9th Division, with 3d Armored Division, mounted and afoot, pass through a break in the Siegfried Line near Roetgen, Germany, 15 September 1944.

Source: U.S. Army Signal Corps, 194023-S, Action Series Collection, U.S. Army Military History Institute, Carlisle Barracks, PA.

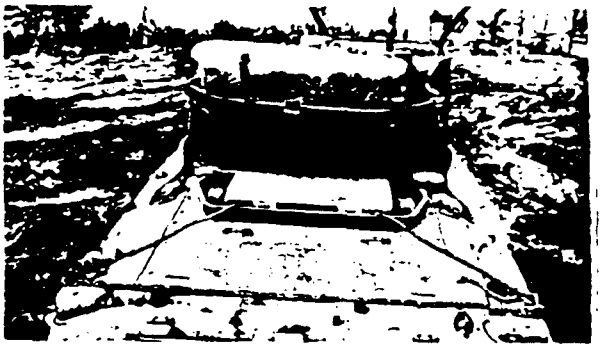
ANNEX F
APPENDIX 5
TANK-MOUNTED INFANTRY

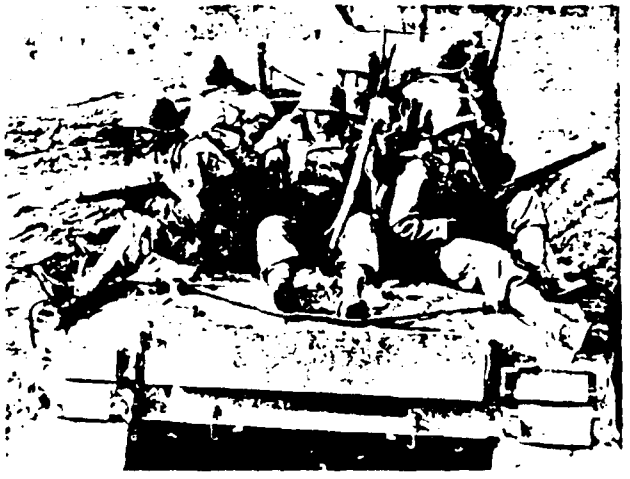
RESTRICTED

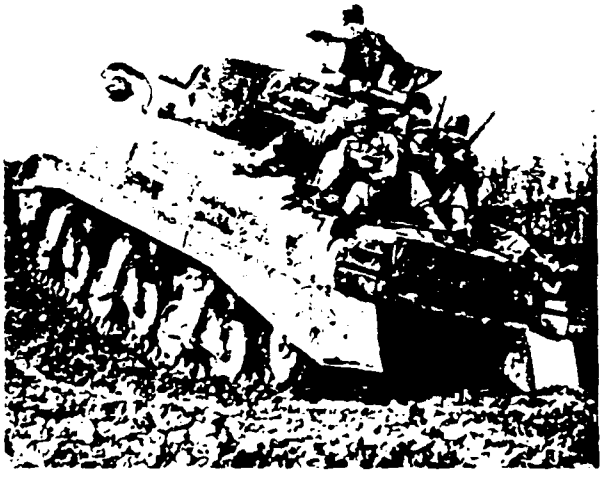
IV - TRANSPORTING INFANTRY ON TANKS

Where it is desirable for infantry to ride the rear decks of medium tanks an arrangement of ropes can be fastened to existing hooks and hinges as shown in the accompanying illustrations. With this simple addition, using 3/4-in. rope, the medium tank can carry six armed infantrymen behind the turret, even over rough terrain.

The idea is presented in a booklet entitled "Infantry-Tank Teams" published by the Armored School and containing a series of exercises for school and instruction purposes. RESTRICTED







Source: U.S. War Department, Operations Division Information Bulletin, Vol. II, No. 6, 29 July 1944; Washington: Office of the Chief of Staff, p. 5-6.

ANNEX G
APPENDIX 1

The 1942 version of the Infantry Field Manual has only one mention of tanks, and they are operating separately from infantry.

and antitank weapons which have survived preparatory fires and by firing in defense of tanks threatened by hostile infantry. Hostile antitank weapons are fired on as soon as they are revealed by flashes or movement.

(3) The tanks usually precede the leading infantry units and attack in two or more echelons. The leading echelon penetrates the hostile forward positions and attacks the hostile light artillery. The rear echelon dominates the hostile forward areas, destroys remaining automatic weapons, and is available to break up counterattacks.

(4) It is essential that the leading rifle companies arrive on the objective close behind the rear tank echelon.

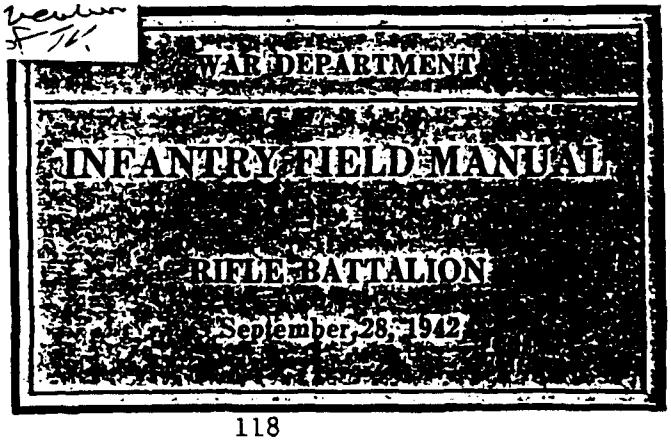
(*a*) Where the line of departure is within 600 yards of the hostile position, the leading rifle companies support the attack by fire and advance as soon as the rear tank echelon reaches the hostile position. Supporting weapons are advanced by echelon in order to maintain continuous fire support of the tank attack; the leading echelon follows the riflemen as closely as possible.

(*b*) When the line of departure is beyond 600 yards from the hostile position and the tank formation does not have great depth, the infantry advances rapidly and occupies successive intermediate objectives not more than 600 yards apart. The advance to each successive objective is initiated as soon as it is reached by the rear tank echelon. Heavy weapons support the attack and displace in the same manner as outlined in (*a*) above.

(*c*) When the line of departure is beyond 600 yards from the hostile position and the tank dispositions are deep enough to cover the entire area between them, the infantry supports the leading echelon of tanks by fire and then advances rapidly close behind the last tank elements. Supporting weapons, while displacing, are prepared for immediate employment.

(5) For further details, see FM 7–40 and 17–10.

c. Location of commander.—During the attack the battalion commander spends much of his time at successive observation posts or with his subordinate units; he is seldom at his command post. He keeps his executive officer, who normally remains at the command post, informed of his location.



The 1942 Regimental Level Manual likewise did not address close integration.

supply of ammunition to the platoons. (For the capabilities and employment of chemical troops in support of infantry, see FM 7–5.)

d. Tanks.—(1) One or more battalions of tanks may be attached to an infantry regiment for an attack. Ordinarily they are employed as a unit under the direct control of the regimental commander. Their objectives coincide in general with those of the regiment.

(2) Tank units support foot troops by—

(*a*) Neutralizing or destroying hostile automatic weapons likely to hold up the advance of foot troops.

(*b*) Making passages through wire or other obstacles for use of foot troops.

(*c*) Maintaining neutralization of hostile resistance by attack in depth until arrival of foot troops on the objective.

(*d*) Neutralizing or destroying hostile reserve and artillery formations in the battle area.

(*e*) Destroying or disorganizing hostile command, communications, and supply installations in the battle area.

(*f*) Breaking up hostile counterattacks.

(3) The regimental commander acquaints the tank unit commander with the situation and plan, and receives the tank officer's recommendations after this officer has made a reconnaissance. The regimental attack order prescribes objectives for the tanks and necessary details for coordination and cooperation between the infantry and tanks and any other attached supporting arms. The orders should provide for close support of the tanks by attached artillery. They should also provide for action by infantry heavy weapons against hostile antitank guns.

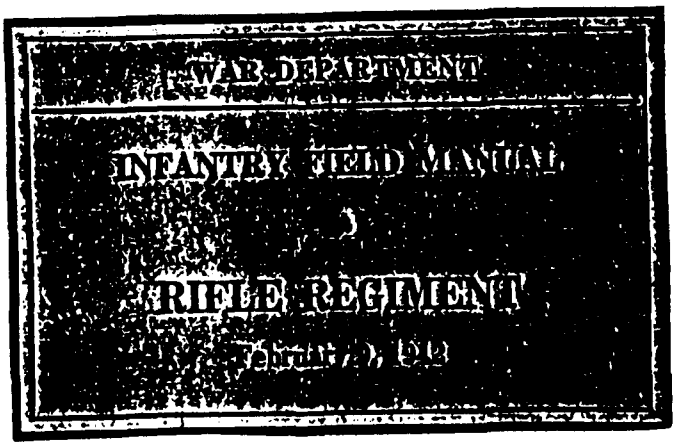
■ 178. SECURITY.—*a. Flank.*—(1) If a regiment is on an exposed flank, the regimental commander may provide for the security of that flank by—

(*a*) Disposing his reserve on that flank (when such disposition is otherwise suitable for the execution of the plan of maneuver) and making it responsible for flank security.

(*b*) Assigning flank security as a mission of the battalion on that flank.

(*c*) Detailing a flank security detachment.

(2) Protection of an interior flank is partially provided by the presence of the adjacent unit. However, the regi-



ANNEX G
APPENDIX 3

By 1944 tank-infantry operations occupy significant space in the Infantry Manual.

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h. Aviation. Aviation normally operates against enemy objectives that are beyond the immediate interest of infantry battalion commanders. However, in a combined air-ground effort (see FM 100-20), friendly aviation may, when conditions demand, be assigned targets close to the infantry front lines or contact zone. Such targets must be readily identified from the air, and controlled by phase lines or bomb safety lines which are set up and rigidly adhered to by both ground and air units. When air power is thus applied in the battalion zone of action, the battalion commander adapts his plans to profit by the air effort. Aviation does not operate in direct support, nor by attachment.

137. TANKS. The inclusion of tanks in an operation affects both the plan of maneuver and the plan of supporting fires.

a. A tank battalion may be attached to an infantry regiment; part of it may in turn be attached to an infantry battalion or be directed to support its attack. When attached, the tank commander becomes a special staff officer, and advises the infantry commander of his tanks' capabilities and makes appropriate tactical recommendations.

b. Part of an infantry battalion may be attached to a tank battalion for local security and groundholding purposes, particularly on distant missions; in such a case, the infantry commander becomes a special staff officer of the tank commander. The attached infantry is moved by trucks when available; however, it may be necessary for them to travel on the tanks. A tank company can carry 75 to 100 infantrymen; six men can ride on the rear deck of a medium tank, and four on a light tank. In rear areas more men can ride, when rope hand holds are provided. (See FM 17-36.) The infantry dismount prior to the launching of the tank attack.

c. The chief limitations on the employment of tanks are unsuitable terrain, i.e., heavy woods and stumps, steep and rocky slopes, deep water courses, and soft ground, especially as these are affected by adverse weather and enemy works. This dictates thorough reconnaissance. (See par. 133.) Even though unsuitable terrain limits the maneuver and shock action of tanks, their cannon and machine-gun fire

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power may still be used. Surprise is sometimes gained by using relatively unfavorable, yet passable, terrain. It must be borne in mind that tanks attract enemy observation by their size, the dust they raise, and the noise they make.

d. Tanks assist the attack of infantry by destroying or neutralizing hostile automatic weapons, reserves, counterattacking troops, artillery, communication and supply installations, barbed wire and similar obstacles, and by dominating objectives—that is, tanks that have arrived on an objective in advance of the infantry move to defilade positions and cover the objective by fire, and at the same time protect each other from hostile antitank measures—until the infantry's attacking echelon arrives and is prepared to defend the position.

e. Infantry assists tanks by destroying or neutralizing hostile antitank weapons and tank-hunting teams, locating and removing mines and other tank obstacles, seizing ground from which tanks may attack, locating defiladed routes of advance for tanks, or taking over an objective which the tanks have captured or are dominating. Tanks are capable of capturing and briefly dominating an objective, but not of holding it for a considerable time and organizing it; they should be replaced on the objective by infantry as soon as possible, and always before nightfall, and ordered back to a rallying point for reorganization and servicing.

f. Unity of command should be clearly prescribed in orders; command must be assigned to the leader of the unit charged with the primary mission.

g. For further details, see FMs 7-40 and 17-36.

138. SUPPLY AND EVACUATION. Before deciding on the supply and evacuation details of his plan, the battalion commander considers the recommendations of the battalion S-4 for the location of the battalion ammunition supply point and route of ammunition advance, and the recommendations of the battalion surgeon regarding establishment of the battalion aid station. For further details, see chapters 4 and 5 and FM 7-30.

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142. LAUNCHING THE ATTACK. *a. With combat team support.* (1) The attack begins when the leading elements of companies in the attacking echelon cross the line of departure. The battalion commander coordinates the forward movement of his units from the assembly area to insure that the leading rifle company elements cross the line of departure at the prescribed hour and that his supporting weapons occupy their initial positions in time to support the rifle elements. He also insures that the movement of the antitank platoon from firing position area(s) which were occupied to protect the battalion assembly area to firing position area(s) for the attack provides uninterrupted protection for the attacking echelon during its movement to its attack positions.

(2) The heavy weapons commence firing in accordance with the battalion plan of supporting fires. The attacking echelon crosses the line of departure in deployed formation; leading rifle units continue their deployed advance until forced to return the hostile fire. The supporting artillery, cannon company, heavy weapons, and chemical mortars are relied upon initially to gain fire superiority. Rifle fire is opened at ranges greater than 500 yards only when other available fire support is inadequate; it is conserved for use at ranges where riflemen can exert maximum effect.

b. With tank support. In infantry-tank action, there are three initial attack dispositions: infantry-leading, tanks-leading, and infantry-tanks-together. Infantry leads initially when reconnaissance has revealed hostile antitank strength or when the terrain in the direction of desired use is unsuitable for tanks; in this case the tanks support the attack by fire, generally from hull defilade positions. Tanks lead initially, when suitable terrain is available, in launching an attack against a hostile position having little antitank strength in terms of antitank guns, tank destroyers, antitank mines and other obstacles, or when these have been neutralized; in this case, elements of the infantry battalion follow within supporting distance and aid the tanks by fire and maneuver. Often the conditions in these two cases will exist in part only, or it can be foreseen that one case or the other will exist at the very outset of the attack only.

Under such circumstances, it will be well to launch the attack with both infantry and tanks in the leading wave. The infantry-tanks-together disposition promotes flexibility, as the commander can rapidly regroup and redispose elements to meet changes in the combat situation. Unity of command in the composite waves may be effected by attaching a portion of a tank company to each rifle company in the attacking echelon. Conditions which may call for infantry-tanks-together initially in the leading wave include close terrain, limited visibility, woods traversable by tanks, mopping-up operations, and night attacks. (See FM 17-36.)

143. CONDUCTING THE ATTACK. During the attack the battalion commander spends much of his time at successive observation posts or with his subordinate units; he is seldom at his command post. He keeps his executive officer, who normally remains at the command post, informed of his location. He must be able to communicate promptly with his command post, all company commanders, and supporting or attached units. When at an observation post, he usually communicates with the command post by telephone, radio, and messengers. In addition to personal reconnaissance, he keeps himself informed of the situation by personal observation and by information received from his intelligence personnel and from subordinate, higher, and adjacent units. He requires frequent combat reports, including special reports upon the capture of an objective or when a rifle company commits its support, also negative reports, when appropriate. Whenever necessary, the battalion commander details a liaison officer to secure information from an adjacent battalion. Frequent visits to the attacking companies by the battalion commander and members of his staff, particularly during critical periods in their action, promote teamwork, coordination of effort, and confidence. During such visits full information of the situation is exchanged. The battalion commander influences the action by shifting the fires of his heavy weapons and those of any *attached* weapons; by requesting that fires of *supporting* cannon company weapons, artillery, chemical or other units either be shifted or render additional assistance; by arranging for mutual assistance between his attacking companies and for cooperative action between them and adjace-

of influencing the action must not be permitted to obscure the importance of maintaining the momentum of the advance. It should be committed without hesitation whenever the attacking echelon can no longer advance or the situation offers an opportunity to expedite the capture of a battalion objective through its employment as a maneuvering unit. The battalion commander prescribes its objective and usually its direction of attack. If possible he prescribes its departure position. He informs other units of the battalion of its contemplated action and shifts supporting fires, as necessary, to assist it. The regimental commander is notified as soon as the decision to commit the battalion reserve has been reached.

d. Use of tanks. In infantry-tank action, when infantry leads, the tanks support the attack initially by fire. If it is impracticable to use them in their primary role of maneuver, shock action, and direct fire tasks, they may be employed to reinforce the fires of the artillery, in which case the latter furnishes them with the requisite firing data. For these reinforcing fires, ammunition requirements must be anticipated, so that the normal loads need not be expended. When tanks lead, that is, when the attacking echelon consists of tanks only, the provisions of FM 17-33 apply, and the infantry supports the attack by fire and maneuver. Artillery time fire (air bursts of high explosive shell, fragments of which are harmless to tank armor) frequently showers the tanks as they advance to the objective; when such time fire is used, following infantry is obliged to keep a minimum distance of 300 yards from the tanks. However, when the time fire lifts, the infantry must be ready to advance rapidly to the objective, seize it and prepare to continue the attack. The tanks, having reached the objective, dominate it pending the arrival of the infantry. When infantry and tanks are together in the leading wave, the commander regroups and redisposes them freely as conditions dictate. Some of the infantry may lead in rough terrain, pathfinding for the tanks or reconnoitering for antitank weapons, mines, and tank-hunting teams; the tank component of the leading wave may push ahead to wipe out hostile automatic weapons or bunkers that are holding up the infantry, or to make paths through barbed

wire and other obstacles. They are held together, not by any rigid or static formation, but by identity of mission and unity of command. The commander moves each component in that portion of the zone where it can best accomplish its mission; not necessarily by the same routes, but always keeping tanks and infantry within mutual supporting distances. The presence of antitank mine fields may be first indicated by the loss of one or more tanks. The tank unit should at once be withdrawn to defilade or hull defilade positions, from which it can support the infantry, while the latter proceeds, protected, by necessary fires and smoke screening, to breach the mine field and mark lanes for the passage of the tanks. Engineers, if available, are attached when extensive mine-lifting operations are foreseen. Tanks may participate by pushing into position and discharging demolition snakes. The enemy's defense of his mine fields may, at times when effective smoke screens cannot be maintained, force the attacker to await darkness in order to breach the fields.

144. SECURITY. Security measures planned on the initiation of the attack (see par. 135*h*) are continued in force or modified according to the progress of the attack.

145. ASSAULT. *a.* In the attack, hostile resistance is frequently reduced by a series of local assaults delivered at different times by rifle companies or platoons. (See FM 7-10.)

b. When the entire battalion is held up in front of a hostile position that cannot be outflanked, the battalion commander arranges for a prepared and coordinated assault by his attacking echelon, supported by the regimental cannon company, the artillery, and his heavy weapons. He either fixes a time for lifting of supporting fires and delivery of the assault, or employs a prearranged signal for this purpose. When supporting fires are lifted, the attacking echelon delivers assault fire, and closes with hand grenade and bayonet. Assault fire comprises rifle, automatic rifle, and carbine fires from kneeling or standing positions when the degree of fire superiority makes this possible, coupled with swift advance between shots. Supporting fires lift to targets on the flanks and in rear. (See FM 7-15.)

218. TANKS. *a.* In the sustained defense, tanks can be used with the infantry battalion in close support of the main line of resistance and for counterattack, the support of the latter being their primary mission. The number of tanks employed depends upon the terrain, the extent of the front held, the enemy situation, and the availability of tank units. Tanks should ordinarily be employed as a unit, if the terrain is suitable. If the terrain is unsuitable for the employment in mass of an entire tank battalion, tank companies or platoons may be attached to infantry battalions or companies. The wider the frontage assigned to a front-line infantry unit in defense, the greater the need for a strong and mobile reserve. Terrain containing many natural tank obstacles may make it necessary to use tanks in small rather than large groups. The infantry battalion commander usually attaches available tanks to the reserve for counterattack. Exceptionally they may be attached to front-line companies for direct fire missions. Tanks may be assigned a secondary mission of reinforcing the fires of the field artillery. For tanks so used, ammunition must be provided and its replacement foreseen, so that the tanks when committed for counterattack will still have their organic loads of ammunition.

b. The tanks supporting the main line of resistance by direct fire initially occupy defiladed positions, from which they may readily move to hull defilade firing positions. If time is available, firing positions are prepared. These firing positions should be located on the flanks of the platoon areas, outside of the protective wire. (See fig. 11.) Each tank must have one or more alternate or supplementary firing positions. Defiladed routes to the rear for withdrawal are essential. If the enemy reaches assaulting distance the tanks can execute local counterattacks in front of the defending infantry.

c. The counterattack may be launched to eject an enemy who has succeeded in penetrating the position or to destroy the enemy while he is forming for an attack. (See fig. 12.) The principal advantage to the defender of this latter type of employment of tanks is to gain time by disorganizing and disrupting the enemy before he can coordinate and launch

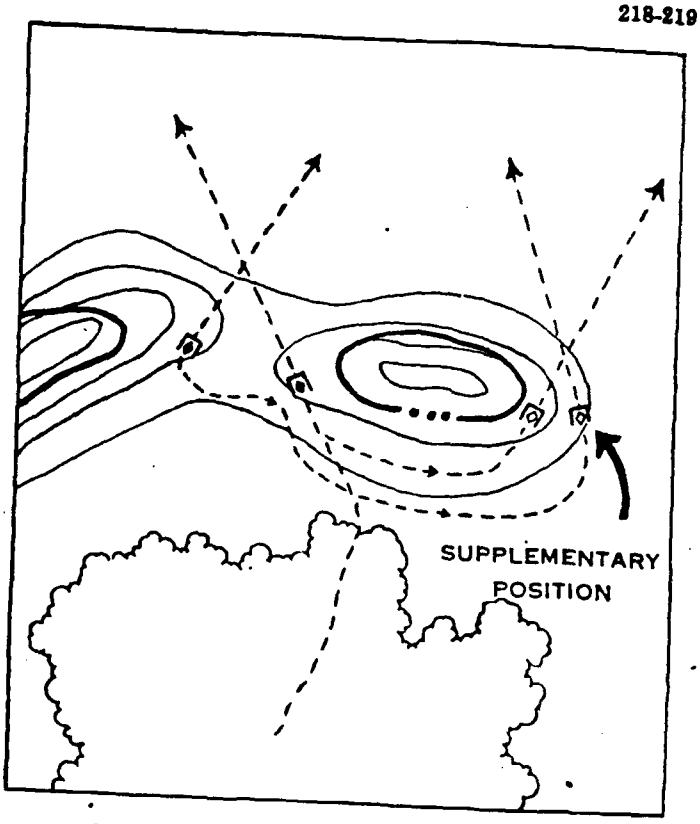

Figure 11. Direct fire position for tanks.

his attack. Tanks will make this type of counterattack alone and receive supporting fires from the infantry and artillery. [For the use of tanks in counterattack with infantry, see par. 225*b*(2).]

219. FIRE PLAN. *a.* The battalion fire plan seeks to take the enemy under fire from the time he enters the zone of surveillance of the combat outpost, hold him under an in-

In 1950, despite the accumulated experience of the war, the regimental level manual still did not address close integration.

the regimental tank company to other units of his regiment. This plan has the advantage of forming a strong force, balanced in fighting structure. Most frequently it is employed in the exploitation phase when the regiment is attacking in a column of battalions and it is desirable to have a strong mobile force at the head of the regiment. It may be employed also when the regiment is attacking with battalions abreast and one portion of the regimental zone is more favorable for tank employment than the remainder of the zone.

f. If one tank battalion is attached, the regimental commander may also employ the tank battalion, less one company, with one infantry battalion; the remaining tank company with another infantry battalion; and the regimental tank company with the remaining infantry battalion. This plan has the advantage of providing strong tank support to each infantry battalion, and it may be used when the regiment is attacking with battalions abreast against determined resistance.

g. If two tank battalions are attached to the regiment, the commander usually employs each of the tank battalions with an infantry battalion and attaches the regimental tank company to the remaining infantry battalion. (For a detailed discussion of the employment of the tank battalion, see FM 17-33.) Command of the balanced infantry-tank team is established by attaching one of the units (tank or infantry) to the other unit which has the primary role in the attack.

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ANNEX G
APPENDIX 5
DOCTRINE

Five methods of employment of tank and infantry:

THEY CAN WORK TOGETHER!

terrific fire power and the shock action. Let me run through them briefly:

TANKS *ACCOMPANY* AND OPERATE WITH THE INFANTRY AT THE SAME SPEED

"This is the method that Don was referring to. The tanks and the Infantry cross the line of departure together, move to the assault position and assault together. Using this technique, control and mutual support is simplified. There is a favorable psychological effect on friendly troops having the tanks alongside of them. But the fire power and mobility of the tanks are not employed to the utmost because they are restricted to the rate of movement of the Infantry. So, this method will be used when control is difficult and visibility poor, such as in close terrain, woods, built-up areas or at night or in heavy rain or fog.

TANKS INITIALLY *SUPPORT* BY FIRE AND THEN MOVE FORWARD RAPIDLY TO *JOIN* THE INFANTRY FOR THE ASSAULT

"In this method, the tanks take up firing positions at or near the line of departure. The Infantry follows the best route to the tentative assault position, and when they deploy for the assault, the tanks join them and they assault together. In this method the tank's fire power, maneuverability and shock action are fully employed. You have accurate fire supporting the Infantry as they move to the Assault Position. In the assault, the tank fire is available when other supporting fire has lifted. Again we have that powerful psychological effect on both friendly and enemy troops — giving us more confidence while scaring the hell out of them.

"This method can be employed when the objective is clearly defined. There should be suitable firing positions for the tanks. The terrain must be suitable for the rapid displacement of the tanks. And this is important — time must be available for the necessary coordination between the tanks and Infantry. You want to avoid having the Infantry wait at the assault position for the tanks. It would be equally foolish for the tanks to wait there for the Infantry. Timing must be exact and communications must be maintained to allow for constant contact between the two units.

TANKS INITIALLY *SUPPORT* BY FIRE AND THEN MOVE FORWARD RAPIDLY TO *PASS THROUGH AND PRECEDE THE INFANTRY ON TO THE OBJECTIVE*

"In this method, the tanks again take up firing positions at or near the line of departure. They cover by fire the movement of the Infantry until it reaches an area well away from the objective. Then, supported by air burst or time artillery fire on the objective, the tanks overrun it and are joined by the Infantry who mop-up and reorganize. The characteristics of this type of an attack are the same as the one just covered. But this should be considered before using this type of an attack — the enemy should have hastily prepared defensive positions with little or no overhead cover so that he is susceptible to time fire. He should be weak in tank defense. So, we can attack this way when the enemy is

Source: Phillips, Alfred, "They Can Work Together," Infantry School Quarterly, October 1952, pp. 33-37.

on the run and hasn't had the time to set up elaborate defenses.

TANKS AND INFANTRY *CONVERGE* ON THE OBJECTIVE FROM DIFFERENT DIRECTIONS

"Here the tanks and Infantry might cross the line of departure at different locations and at different times. Using different routes, and different assault positions, they meet on the objective and reorganize together. In this type of an attack, you use the speed and maneuverability of the tanks to the utmost. There is a certain amount of surprise achieved on the enemy when you hit him from different directions. But here are some weaknesses to this type of an attack. First of all, the Infantry does not have the supporting fire of the tanks either when they move from the line of departure to the assault position, or in the assault. The tanks are extremely vulnerable to antitank weapons as they maneuver over terrain not cleared by the Infantry or terrain where the Infantry cannot cover their movement. By separating the tanks and Infantry, control is difficult. So, you use this method when the terrain is such that it is better to temporarily split the team. Say, you have swamps that the Infantry can negotiate and find good cover and open terrain nearby that would be a preferable route for the tanks. And remember, here again the closest coordination must be made, and constant contact between units maintained.

TANKS SUPPORT THE INFANTRY BY OVERHEAD FIRE ALONE

"This is another method that we can use. Here, the tanks take up firing positions at or near the line of departure and cover by fire the movement of the Infantry to the assault position, and in its assault until its fires are masked. Using this method we take advantage of only one of the three basic capabilities of the tank, its fire power. This method should only be employed when there is a tank obstacle in our zone that forbids the tanks being employed any other way. Should such a situation exist, plans must be made before the attack for the movement of the tanks through the zone of adjacent units so the tanks can rejoin your unit as soon as possible. This requires coordination with the commander of the bordering unit or with the next higher commander.

"Now, in presenting these five basic methods for employing an Infantry-tank team, that doesn't mean that only one can be selected for an attack and followed through all the way. Again, the situation or the terrain might dictate modifying the method selected. It often happens that the tanks move forward by bounds to cover the movement of the Infantry to the assault position, and then join it in the assault. Or when we are in pursuit of a rapidly retreating enemy, you can have the Infantry actually ride on the tanks to permit maximum speed in movement. The only thing to consider in letting Infantry ride on tanks is that they are extremely vulnerable to enemy fire out on the tank's decks, and the traverse of the tank's cannon is restricted until the Infantry men jump off."

Pieper paused to take another sip of his beer. Tanker Tom, who had been nodding his head in agreement

at all that Pieper had said, then added this,

"All that you say makes an awful lot of sense. But if the rifle company commander is the leader of the Infantry-tank team you describe, he will have to remember that tanks require daily maintenance. He will have to give the tanks an opportunity to refuel and resupply. After the objective is taken and reorganization completed, the tanks should be withdrawn a few tanks at a time, or section echelon, to an area where resupply can be made."

Don the Infantryman then added his bit,

"If all this is going to work in combat, the tanks and Infantry should be trained in these team tactics here in the States. Each rifleman should be shown how to designate targets with his rifle by actually firing at a location and then having the tank clobber it with its gun. Or, have the target designated over the phone mounted on the back of each tank. Using the direction that the gun is pointing as 12 o'clock, the rifleman can use the clock system to point out the target. By running attacks together, we can work out a smooth running infantry-tank team."

Joe the Vet then moved up to our beaming trio. This air of mutual esteem and accord was new to him. Polishing the space before them, he said,

"All right, you guys, either drink up or shut up. It's getting late. Besides, who's interested in the Infantry-tank team? Now, take the Air Force. Let me tell you about that run over the Ploesti oil fields. There I was . . ."

"Three beers," interrupted Pieper, "and you told us about Ploesti before."

A fool can profit by his own experience but I prefer to profit from the experience of others.

Bismarck

ANNEX G
APPENDIX 6
DOCTRINE

Three methods of tank-infantry assault:

Infantry and Tanks Attack on the Same Axis. This method should be used when there is only one avenue of approach to the objective, and when the tanks have firing positions along that approach and maneuver room so that they can join the Infantry in the attack.

With good visibility and fields of fire, the tanks can support the Infantry by fire and then join the Infantry in the assault. When the enemy has little overhead cover, a good technique is for the tanks to pass through the Infantry and lead the assault under cover of airburst artillery fire. Both of these techniques give maximum speed, fire power and shock action.

When visibility and fields of fire are restricted, tanks and Infantry should advance together. When practicable, tanks should lead. This technique is easy to control and mutual support is simplified. The tanks' fire power and shock action is utilized but the speed of the attack is held down to the rate of the Infantry.

Infantry and Tanks Attack on Converging Axes. This is the best methods of attack, since it capitalizes on surprise and makes the enemy fight in two directions. It is also the most difficult method to coordinate. The rifle company commander must have good communications with the tank platoon leader.

This method can be used when there are two approaches to the objective, at least one being a good approach for tanks and one a good approach for Infantry. If one axis is used exclusively by tanks and the other exclusively by Infantry, mutual support will be partly lost for a while. The tanks can support the riflemen until they move to the assault position. At this time, both the Infantry and tanks converge on the common objective so that they arrive on the objective simultaneously; or the tanks can arrive first, with overhead artillery fire being used until the Infantry arrives.

When both avenues of approach are good, tanks and Infantry can be used on both axes. One axis may be predominantly tanks while the other is predominantly Infantry. This technique may be difficult to coordinate, but it will give the maximum surprise.

Tanks Support by Fire Only. This is the least desirable method of the three and should be used only when the other two are completely impractical. Though the tanks can effectively support the Infantry for a time by fire alone, their shock action and a part of their fire power will inevitably be lost. The commander of the team should arrange for the tanks to join the Infantry on the objective as soon as possible.

This method must be used when the tanks cannot cross the terrain or when certain obstacles cannot be cleared until the objective is taken. An example of this is where there are anti-tank mine fields that are covered by fire from the objective. In river crossings, the Infantry may have to first eliminate enemy direct fire at the crossing site before the tanks can be brought over by bridge or ferry.

Source: Clark, Lyman, "Infantry and Tanks, Inc.," Infantry School Quarterly, October 1953, pp. 104-107.

ENDNOTES

1. General Burnod, Napoleon's Maxims, p. 87.

2. General George B. Crist, "A U.S. Military Strategy for a Changing World," Strategic Review, Winter 1990, p. 16.

3. Major Godwin, "Discrepancy in Light Infantry Missions and CSA Directives," The Infantry Conference Booklet, 1987.

4. Crist, pp. 19-20.

5. General Edwin H. Burba, Implementing National Military Strategy, lecture, 16 January 1991.

6. Department of the Army, The Army Plan (TAP), FY1992-2007, March 1990, p. 14.

7. Major William B. Caldwell, IV, Not Enough to Get There, Not Heavy Enough to Win: The Case of Light Infantry, SAMS Monograph, 4 December 1987.

8. Senator Sam Nunn, "A New Military Strategy," The Congressional Record - Senate, April 18, 1990, p. 4453.

9. Henry S. Hastings, Employment of Armored Infantry, Monograph, Armor Officer's Advanced Course, p. 4.

10. Howard G. Crowell, Jr., and Jared L. Bates, "Heavy-Light Connection: Division," Infantry, July-August, 1984, p. 18.

11. Secretary of the Army's Semiannual Report, January-June 1953, p. 115.

12. General George Catlett Marshall, The Papers of George Catlett Marshall, from a speech at Milwaukee, WI, September 1941, pp. 606-607.

13. U.S. Army Military History Institute, Experiences in Division Command, 1986, p. 27.

14. Richard M. Ogorkiewicz, Armor - A History of Mechanized Forces, pp. 322-323.

15. Robert H. Adleman and George Walton, The Devil's Brigade, p. 58.

16. General Herman Balck, "Translation of Taped Conversation with General Herman Balck, 13 April 1979," p. 13.

17. Scott R. McMichael, A Historical Perspective on Light Infantry, p. 200.

18. Military Operations Research Unit, Operation Goodwood, tour booklet.

19. Colonel George W. Coolidge, AGF Report No. 385, 27 November 1944, p. App. A-1.

20. Roland Anderson, 135th Infantry Regiment, 34th Tank Division, North Africa, 26 Mar-11 Apr 43, p. 133.

21. Colonel James H. Dyson, "With the 2nd Armored Division from Benning to Berlin," interview, 22 December 1990.

22. U.S. Army Ground Forces Observer Board. Report of Observers: Mediterranean Theater of Operations, Vol. V. Paper prepared by Major General Harmon, Cdr VI Corps, 1 April 1944, disseminated to platoon level in Italy, p. A-147-1C.

23. Orgorkiewicz, p. 385.

24. Department of the Army, Army Lineage Book, Vol. II, Infantry, 1953, p. 48.

25. Brian Bond and Martin Alexander, "Liddell Hart and DeGaulle: The Doctrine of Limited Liability and Mobile Defense," in Makers of Modern Strategy, ed. by Peter Paret, p. 601.

26. General George Patton, "Infantry Division Conference, Bad Nauheim, GE, 20 Nov 1945," in Organization, Equipment, and Tactical Employment of the Infantry Division, Report 15 of the General Board, ETO, 1946, by BG A. Kibler and BG H. N. Hartness.

27. General Erwin Rommel, The Rommel Papers, p. 201.

28. William L. Roberts, "Employment of Armored Infantry of an Armored Division," Military Review, Vol. 23, May 1943, p. 36.

29. Richard M. Orgorkiewicz, "The Evolution of Armored Tactics," Military Review XXXVII, February 1958, p. 35.

30. John A. English, On Infantry, p. xxvii.

31. Orgorkiewicz, p. 37.

32. Dr. Robert R. Palmer, Reorganization of Ground Troops for Combat, Study No. 8, p. 18.

33. Palmer, Reorganization of Ground Troops for Combat, Study No. 8, Memorandum of LTG J. L. Devers, Chief of the Armored Force, 1 Nov 1942, p. 19.

34. BG J. A. Holley and LTC S. G. Fries, Organization, Equipment, and Tactical Employment of Separate Tank Battalions, Study 50 of the General Board, ETO, 1946, p. 4.

35. Holley and Fries, Combat Study No. 3, AGF, Historical Section 1946.

36. U.S. Army Ground Forces Observer Board. The Armored Force Command & Center AGF Study No. 27, p. 47.

37. General George Patton, in "Tanks in Sicily," Cavalry Journal, May-June 1944, by W. B. Goddard, p. 8.

38. U.S. Army Ground Forces, The Organization of Ground Combat Units, p. 468.

39. General Leslie J. McNair, in Reorganization of Ground Troops for Combat, Study No. 8, by Robert R. Palmer, p. 36.

40. Ibid., p. 34-35.

41. U.S. Army Ground Forces, p. 462.

42. BG G. A. Kibler and BG H. N. Hartness, Organization, Equipment and Tactical Employment of the Infantry Division. Report 15 of the General Board, ETO, p. 1.

43. BG J. A. Holley and LTC S. G. Fries, Organization, Equipment and Tactical Employment of Separate Tank Battalions. Study 50 of the General Board, ETO, P. 9.

44. General Matthew B. Ridgeway, The Korean War, p. 34.

45. Alfred Phillips, "They Can Work Together," Infantry School Quarterly, October 1957, p. 33.

46. John Burney, "Armor and Airborne at Arnheim," Armor, Mar-Apr 1955, pp. 36-37.

47. Scott R. McMichael, A Historical Perspective on the Light Divisions, CSI No. 6, p. 13.

48. T. R. Fehrenbach, This Kind of War: A Study in Unpreparedness, p. 18.

49. Dennis J. Vetock, Lessons Learned: A History of U.S. Army Lesson Learning, p. 2.

50. Ibid.

51. Ibid., pp. 57-58.

52. S. L. Lewis, Forgotten Legions: German Army Infantry Policy, 1918-1941, p. 56.

53. Williamson Murray, "The German Response to Victory in Poland," Armed Forces and Society 2, Winter 1980, p. 287.

54. Ibid.

55. Ibid.

56. Ibid., p. 287-288.

57. Drew Middleton, "The Battle for North Africa," New York Times Magazine, 7 November 1982, p. 48.

58. Kibler and Hartness, p. 1.

59. MG Orlando Ward, "The Tank-Infantry Section," Infantry Journal, September 1945, p. 8.

60. U.S. Army Ground Force Observer Board, Report of Observers, Mediterranean Theater, Vol. V, 5th Army on the Carano Road East of Fosso Della Pedata, Italy, 1944, p. A-144-2.

61. U.S. Army Armored School, A Critical Analysis of the History of Armor in World War II, 1953, p. 13.

62. Jonathan M. House, "Designing the Light Division," Military Review, p. 45.

63. Roy Moore, "Why Not Tanks," Infantry Journal, March 1945, p. 18.

64. C. R. Cawthon, "Plan beyond the Assault," Army, December 1958, p. 34.

65. Ibid.

66. Dr. Robert R. Palmer, Reorganization of Ground Troops for Combat, Combat Study No. 8, p. 18.

67. Charles E. Heller and William A. Stofft, America's First Battles, 1776-1965, p. 234.

68. Ibid., p. 251-252.

69. Ibid., p. 261.

70. Ibid., p. 264.

71. Bryan Perrett, Desert Warfare, p. 128.

72. Ibid., p. 154-156.

73. Ibid., p. 161.

74. Ibid., p. 127-128.

75. U.S. Army Ground Forces Report of Observers. Mediterranean, Vol. V, Report No. 147, p. 11.

76. U.S. Army Ground Forces Observer Board ETO. AGF Report No. 1000, 31 May 1945, Separate Tank Battalions, p. 1.

77. McMichael, p. 198.

78. MG Robert T. Frederick, Interview at the Pentagon, 7 January 1949, p. 2.

79. Kibler and Hartness, p. 14.

80. Hastings, p. 8.

81. Holley and Fries, p. 7.

82. Dyson, p. 1.

83. Ibid.

84. "Tanks and Doughboys," Infantry Journal, July 1945, p. 9.

85. Ibid.

86. Department of the Army, Historical Study, Russian Combat Methods, p. 46.

87. U.S. Army Ground Forces Observers Board, Vol. V. Report No. 1120, pp. 1-7.

88. U.S. Army Ground Forces Observers Board, Vol. II. Report No. 191.

89. Ibid.

90. Ibid.

91. William M. M. Cutler, "Cooperation with the Infantry," The Cavalry Journal, Jan-Feb 1945, p. 28.

92. William Bell, "The First Five Months," Armor, Vol. 59, Nov-Dec 1950, p. 19.

93. Holley and Fries, p. 6.

94. U.S. Army Ground Forces Observer Board. AGF Report No. 693.

95. U.S. Army Ground Forces Observer Board. AGF Report No. 385, p. 14.

96. Ibid., p. 10.

97. Dyson.

98. OCAFF Training Bulletin No. 1, 1953, p. 910.

99. Heller and Stofft, p. 273.

100. Ibid.

101. Avraham (Bren) Adan, On the Banks of the Suez, p. 430.

102. Elizabeth Monroe and A. H. Farrah-Hockley, Adelphi Papers, The October War.

103. General Frederick Kroesen, "The Ultimate Weapon of War," RUSI Journal, 12 December 1980, p. 63.

104. LTC James Grazioplene, Operation Just Cause Observations, a lecture, 27 February-1 March 1990.

105. U.S. Army Ground Forces Observer Board. Mediterranean: Vol. V, AGF Report No. 147, p. 11.

106. Carey A. Clark, Armor in the Hurtgen Forest: A Research Report, p. 27.

107. MG James Gavin, On to Berlin, p. 181.

108. J. D. Balmer, L. Compton, and P. B. Bell, Study of Organization, Equipment, and Tactical Employment of Tank Destroyer Units, Study 60 of the General Board, p. 18.

109. OCAFF, Notes on Combat in Korea, 16 April 1952.

110. Grazioplene.

111. Caldwell, p. 15.

112. Palmer, p. 37.

113. "Role of U.S. Light Infantry," Janes Defense Weekly, 29 October 1988, p. 1076.

114. Major Benjamin Harvey, Feedback from Visits and Conversations with the United States Army Light Divisions, p. 2.

115. Virgil Ney, Evolution of the U.S. Army Division, 1939-1968, p. 49.

116. Palmer, p. 41.

117. Vern G. Tosh and James B. Hobson, "Ground Mobility: Pentomic Infantry Division," Infantry, July 1957, pp. 38-39.

118. Ibid., p. 36.

119. LTG Ronald L. Watts, VII Corps After Action Report, Light Infantry Employment in the European Environment, Reforger 88, November 18, 1988, p. 17.

120. J. F. C. Fuller, "The Foundations of the Science of War," an article published in The Army Quarterly, July 1920, before publication of his book of the same title, p. 104.

121. Murray, p. 285.

122. Department of the Army, Corps Operations, FM 100-15, 15 November 1988, Ch. 5, pp. 47-50; Ch. 6, pp. 36-39.

123. War Department, Infantry Field Manual: Rifle Battalion, FM 7-20, 28 September 1942.

124. War Department, Infantry Battalion War Department Field Manual, FM 7-20, 1 October 1944.

125. War Department, Employment of Tanks with Infantry, FM 17-36, 7 February 1944.

126. Ward, p. 9.

127. Phillips, pp. 35-36.

128. Lyman H. Clark, "Infantry and Tanks," Infantry School Quarterly, p. 102.

129. Hastings.

130. Bell, p. 19.

131. Patrick Donaldson, "Combined Arms Training," Armor, Jul-Aug 1971, p. 4.

132. MG Thomas G. Foley, Armor Support to Light Forces, Memorandum, 23 April 1990, p. 1.

133. General William E. Depuy, "The Light Infantry, Indispensable Element of a Balanced Force," Army, June 1985, p. 37.

134. Dyson.

135. LTC Jim Montano, Operational Employment of Light Infantry Divisions, Fort Ord, CA, 6 July 1987.

136. General Edwin H. Burba, "FORSCOM in a Changing Era: Gulf Crisis Demonstrates the Need for Contingency Force Versatility," Army Green Book, October 1990, pp. 50-51.

137. LTC John M. Hutcheson, Armor Support to Light Forces Conference, 27 February-1 March 1990. 6 March 1990.

138. U.S. Marine Corps, The Marine Air-Ground Task Force, Operational Handbook 2, pp. 5-23.

139. Richard Saunders, "Light Armor: Necessary Addition to the Light Infantry Division," pp. 78-85.

140. Burba, p. 52.

141. U.S. Army Ground Forces Observer Board, AGF Report No. 147, Mediterranean Theater, pp. A132-3.

142. Ibid., p. 13.

143. Armor School and Center, 735th Tank Battalion in the Reduction of METZ, p. 13.

144. Ibid., p. 59.

145. Clark, p. 24.

146. Clark, p. 20-22.

147. COL H. R. Emery, "Armored Support in Forest Country," Military Review, February 1951, p. 94.

148. U.S. War Department, General Staff, Operations Division Information Bulletins (OPDIB), Vol. I, No. 1, 20 January 1944, p. 2.

149. U.S. Army C&GSC, "No Margin for Error," Combined Arms Actions since 1939, pp. 16-4 to 16-6.

150. "Tanks and Doughboys," Infantry Journal, July 1945, p. 9.

BIBLIOGRAPHY

BOOKS

Adan, Avraham (Bren). On the Banks of the Suez. New York: Presidio Press, 1980.

Adleman, Robert H., and Walton, Georgia. The Devil's Brigade. New York: Bantam Books, 1966.

Bidwell, Shelford. Modern Warfare: A Study of Men, Weapons and Theories. London: Allen Lane, 1973.

Blumenson, Martin. The Patton Papers. Boston: Houghton Mifflin, 1972-74.

Burnod, General. Napoleon's Maxims. Translated by G. C. D'Aguilar. Philadelphia: D. McKay, 1932.

Chuikov, Vasila I. Marshal. The End of the Third Reich. Translated by Ruth Kisch. London: MacGibbon and Kee, 1967.

Cole, Hugh. The Ardennes: Battle of the Bulge. U.S. Army in World War II, Edited by Stetson Conn. Washington, D.C.: U.S. Government Printing Office, 1965.

Cole, Hugh Marshall. The Lorraine Campaign. Vol. 5 of the War Department, Sub-Series I of U.S. Army in World War II, edited by Kent Greenfield. Washington, D.C.: U.S. Government Printing Office, 1950.

Ellis, Lionel Frederic. The War in France and Flanders, 1939-1945. London: H.M. Statistical Office, 1953.

English, John A. On Infantry. New York: Praeger, 1984.

Fehrenbach, T. R. This Kind of War: A Study in Unpreparedness. New York: Macmillan Co., 1963.

Forty, George. Patton's Third Army at War. New York: Charles Scribner's Sons, 1978.

Fuller, J.F.C. Armored Warfare: An Annotated Edition of Lectures on F.S.R. III. Harrisburg, PA: Military Service Publishing Co., 1943.

Gavin, James M. On to Berlin, Battles of an Airborne Commander, 1943-1946. New York: The Viking Press, 1978.

Greenfield, Kent, ed. In Command Decisions. Washington, D.C.: U.S. Government Printing Office, 1960. "The 90 Division Gamble," by Maurice Matloff.

Heckmann, Wolf. Rommel's Kreig in Afrika. Garden City, NY: Doubleday, 1981.

Heller, Charles E., and Stofft, William A., eds. America's First Battles, 1776-1965. Lawrence: University Press of Kansas, 1986.

Jackson, William Godfrey Fotherg, II. The Battle for Italy. New York: Harper & Row, 1967.

Kennedy, Robert M. The German Campaign in Poland, 1939. Washington: Department of the Army, 1956.

Kirkland, Donald E. Rommel's Desert Campaigns, February 1941-September 1942, A Study in Operational Level Weakness. Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College, 1986.

Lewis, S. L. Forgotten Legions: German Army Infantry Policy, 1918-1941. New York: Praeger, 1985.

Liddell Hart, B. H., Sir. History of the Second World War. New York: Perigee Books, B.G. Putnam & Sons, 1982.

Liddell Hart, B. H., Sir. The Other Side of the Hill. London: Hamilton & Co., 1956.

Liddell Hart, B. H., Sir. Why Don't We Learn from History? New York: Hawthorn Books, 1972.

Luvaas, Jay. The Military Legacy of the Civil War: The European Inheritance. Lawrence, KS: University Press of Kansas, 1988.

Lynch, John S.; Kennedy, John W.; and Wooley, Robert L. Patton's Desert Training Center. Fort Meyer, VA: Council on America's Military Past, 1986.

Macksey, Kenneth. Tank Warfare: A History of Tanks in Battle. New York: Stein and Day, 1971.

Macksey, Kenneth, Ed. The Guiness Book of Tank Facts and Feats, A Record of Fighting Vehicle Achievement. Middlesex: Guiness Superlatives Limited, 1972.

Marshall, George Catlett. The Papers of George Catlett Marshall. Edited by Larry I. Bland, Vol. 2. Baltimore, MD: The John Hopkins University Press, 19j86.

Mellenthin, F. W. Von. Panzer Battles: A Study of the Employment of Armor in the Second World War. Translated by H. Betz and edited by L.C.F. Turner. Norman, OK: University of Oklahoma Press, 1956.

Miksche, Ferdinand Otto. Attack: A Study of Blitzkrieg Tactics. New York: Random House, 1942.

Mitcham, Samuel W. Triumphant Fox: Erwin Rommel and the Rise of of the Afrika Korps. New York: Stein and Day, 1984.

Ogorkiewicz, Richard M. Armor--A History of Mechanized Forces. New York: Frederick a. Praeger, 1960.

Paret, Peter, ed. Makers of Modern Strategy. Princeton, NJ: Princeton University Press, 1986.

Perrett, Bryan. Desert Warfare. Northamptonshire: Patrick Stephens Ltd., 1988.

Ridgeway, Matthew B., General. The Korean War. New York: Doubleday and Company, 1967.

Rommel, Erwin. The Rommel Papers, edited by B. H. Liddell Hart. New York: Harcourt, Brace, 1953.

Rosinski, Herbert. The German Army. New York: Harcourt, Brace, 1940.

Speidel, Hans. Invasion 1944: Rommel and the Normandy Campaign. Westport, CT: Greenwood Press, 1971.

Strachan, Hew. European Armies and the Conduct of War. London: Allen & Unwin, 1983.

Wardrop, Jake. Tanks across the Desert: The War Diary of Jake Wardrop. London: W. Kimber, 1981.

Weller, Jac. Weapons and Tactics: Hastings to Berlin. New York: St. Martin's Press, 1966.

Westphal, Siegfried. The German Army in the West. London: Cassell, 1951.

Young, Desmond. Rommel, The Desert Fox. New York: Harper, 1950.

JOURNALS AND MAGAZINES

"Armored Infantry." Military Review, June 1945, p. 43.

Bautz, Edward. "The Tank-Infantry Team in an Armored Division." Cavalry Journal, May-June 1946, pp. 21-24.

Bell, William Gardner, Editor. "The First Five Months: Korea and Armor." Armor, Vol. 59, Nov-Dec 1950, No. 6, pp. 18-19.

Burba, Edwin H., Jr. "FORSCOM in a Changing Era: Gulf Crisis Demonstrates the Need for Contingency Force Versatility." Army Green Book, Oct 1990, p. 50.

Burney, John C.,CPT. "Armor and Airborne at Arnheim." Military Review, Dec 1954, pp. 31-38.

Cawthon, C. R. "Plan Beyond the Assault." Army, Dec 1958, pp. 28-34.

Clark, Lyman H. "Infantry and Tanks, Inc." Infantry School Quarterly, Oct 1953, p. 100.

Crist, George B. "A U.S. Military Strategy for a Changing World." Strategic Review, Winter 1990, pp. 16-24.

Crockett, James C. "Armored Infantry in Armored Operations." Cavalry Journal, Vol. LII, Jan-Feb 1943, pp. 22-24.

Crowell, Howard G., Jr., and Bates, Jared L. "Heavy-Light Connection: Division." Infantry, Vol. 74, Jul-Aug 1984, pp. 15-18.

Cutler, William M. M., CPT. "Cooperation with the Infantry." The Cavalry Journal, Vol. LIV, Jan-Feb 1945, p. 28.

DePuy, William E., GEN. "Infantry Combat." Infantry, Mar-Apr 1990, pp. 8-13.

DePuy, William E., GEN. "One-Up and Two Back?" Army, Jan 1980, pp. 20-25.

DePuy, William E., GEN. "The Light Infantry: Indispensable Element of a Balanced Force." Army, Vol. 35, June 1985, pp. 26-41.

Donaldson, Patrick. "Combined Arms Training." Armor, Jul-Aug 1971, p. 4.

Emery, H. R., COL. "Armored Support in Forest Country." Military Review, Vol. 30, No. 11, Feb 1951, pp. 93-95.

Poss, John W. "Commandant's Note: Heavy-Light Mix." Infantry, Vol. 75, Sept-Oct 1985, pp. 2-3.

Fuller, J. F. C. "The Foundations of the Science of War." The Army Quarterly, July 1920, pp. 90-111.

Galvin, John. "Heavy-Light Forces and the NATO Mission." Infantry, Jul-Aug 1984, pp. 11-14.

G-3 Division, Supreme Headquarters, Allied Expeditionary Force. "Employment of Tanks and Infantry in Normandy." Military Review, Dec. 1944, pp. 13-17.

Gerbert, Charles. "Teamwork between Infantry and Tanks." Infantry Journal, Jan-Feb 1936, p. 86.

Goddard, W. B., LTC. "Tanks in Sicily." Cavalry Journal, May-Jun 1944, pp. 6-8.

Hollingsworth, James F., LTG. "The Light Division." Armed Forces Journal, Oct 1983.

Icks, R. J., COL. "Integrated Armor." Armor, Vol. 60, No. 1, Jan-Feb 1951, pp. 37-39.

"Infantry-Tank Team." A Letter to the Editor. Infantry Journal, Aug 1945, p. 62.

Isby, David C. "The U.S. Army's New Light Infantry Divisions." Jane's Military Review, ed. IV. 1986, pp. 92-110.

Koroloev, M., MG. "Tank-Infantry Attack." Cavalry Journal, Sept-Oct 1943, pp. 63-65.

Kroesen, Frederick J. "The Ultimate Weapon of War." RUSI Journal, 12 Dec 1980, pp. 62-64a. The Employment of Non-Mechanized Infantry. Report of symposium jointly sponsored by RUSP and Commander, ACE mobile force (land), held in Hamburg on 28 April 1980.

Liddell Hart, B. H., Sir. "Was the 1940 Collapse Avoidable?" Military Review, Vol. 30, No. 3, June 1950, pp. 3-9.

Mahaffey, Fred K. "Structuring Force to Need." Army, Vol. 34, Oct 1984, pp. 204-216.

Manteuffel, Von H. E., GEN. "The Decisive Arms in Ground Combat." Armor, Vol. 59, No. 5, Sep-Oct 1950, pp. 18-21.

Monroe, Elizabeth, and Farrah-Hockley, A. H. "The October War, 1973: Background and Events." Adelphi Papers, No. III, 1975.

Moore, Roy E., LTC, and Bernard, Lyle W., LTC. "Why Not Tanks?" Infantry Journal, March 1945, pp. 17-18.

Murray, Williamson. "The German Response to Victory in Poland." Armed Forces and Society 2, Winter 1980, pp. 285-98.

Newell, Clayton R. "Heavy-Light Forces: Divisions or Brigades?" Infantry, Vol. 75, Jan-Feb 1985, pp. 13-14.

"Normal U.S. Field Army of World War II (Organization and Strength)." Armor, Vol. 63, Mar-Apr 1954, p. 18.

Ogorkiewicz, R. M. "Armor in Defeat." Armor, Vol. 59, No. 4, Jul-Aug 1950, pp. 16-22.

Ogorkiewicz, R M. "The Evolution of Armored Tactics." Military Review, XXXVII, Feb 1958, pp. 31-39.

Phillips, Alfred, CPT. "They Can Work Together." Infantry School Quarterly, Oct 1952, pp. 33-36.

Pickett, T. R., LT. "The Tank Infantry Team at Work." Armor, Vol. 60, No. 3, May-Jun 1951, pp. 9-11.

Richardson, William R., LTG. "Light Infantry." RUSI Journal, Vol. 25, Dec 1980, pp. 64-67.

Roberts, William L. "Employment of Armored Infantry of an Armored Division." Military Review, Vol. 23, May 1943, pp. 33-37.

"Role of U.S. Light Infantry." Jane's Defense Weekly, 29 Oct 1988, pp. 1076-1077.

Saunders, Richard M. "Light Armor: Necessary Addition to the Light Infantry Division." Armed Forces Journal International, Vol. 122, Nov. 1984, pp. 78-85.

Scotter, William. GEN. Sir. "A Role for Non-Mechanized Infantry." RUSI Journal, Vol. 125, Dec 1980, pp. 59-62.

Silcox, James H., MAJ. "Team Spirit: Light Infantry in Mid-Intensity Conflict." Infantry, Sep-Oct 1989.

Simpkin, Richard E. "The Heavy Force/Light Force Mix Up." Armor, Jul-Aug 1985.

"Tanks and Doughboys." Infantry Journal, Jul 1945, pp. 8-9.

"Tanks in the Infantry Regiment." A Letter to the Editor. Infantry Journal, Jul 1945, p. 62.

Tosh, Vern G., and Hobson, James B. "Ground Mobility: Pentomic Infantry Division." Infantry, Jul 1957, pp. 35-39.

Ward, Orlando, MG. "The Tank-Infantry Section." Infantry Journal, Sep 1945, pp. 8-9.

NEWSPAPERS

"Does America Need An Army?" U.S. News and World Report, p. 22, 4 Dec 89.

Matthews, William. "Pentagon Plan Reduces Army to 12 Active Divisions." Army Times, p. 9, 13 Aug 90.

Middleton, Drew. "The Battle for North Africa." New York Times Magazine, p. 48, 7 Nov 82.

PUBLIC DOCUMENTS

Anderson, Roland. 135th Infantry Regiment, 34th Infantry Division, Vicinity of Fondouk el Okbi, North Africa, 26 Mar-11 Apr 43. Monograph, WWII Operations, Fort Benning, GA: The Advanced Officers Course, 1946-1950.

Advisory Panel on Armor. Report of Army Field Forces Advisory Panel on Armor to Chief of Staff, U.S. Army. Fort Monroe, VA, 18 Feb 1949.

Armor School and Center. The Separate Tank Battalion in Support of Infantry in River Crossing Operations (ETO). Student Committee Reports 49/50, Fort Knox, KY: The Armored School, May 1950.

Armor School and Center. A Study of the Adequacy of the TO&E of Armored Infantry Battalion in Regard to the Present Doctrine of Armor. Student Committee Repforts 52/53, Fort Knox, KY: The Armored School, May 1953.

Armor School and Center. The 1st Armored Division at Faid-Kasserine. Student Committee Reports 48/49, Fort Knox, KY: The Armored School, May 1949.

Armor School and Center. Employment of Armor in Korea - The First Year. Student Committee Reports 51/52, Fort Knox, KY: The Armored School, May 1952.

Armor School and Center. 735th Tank Battalion in the Reduction of Metz. Student Committee Reports 49/50, Fort Knox, KY: The Armored School, May 1950.

Balck and Von Mellenthin. GEN Balck and Von Mellenthin on Tactics: Implications for NATO Military Doctrine. Carlisle Barracks, PA: U.S. Army War College, 1983.

Balmer, J. D.; Compton, L.; and Bell, P. B. Study of Organization, Equipment, and Tactical Emplyment of Tank Destroyer Units. Study 60 of the General Board, U.S. Army Porces European Theater, 1946.

Boucher, C. Tank Destroyer Units with the Infantry Division. Report C-970 of the War Department Observer Board, U.S. Porces European Theater, 1945.

Brugmann, G., BG. Setting the Scene - The European Battlefield: The Employment of Non-Mechanized Infantry. Report of Symposium jointly sponsored by RUSI and the Commander, ACE Mobile Force (Land), held in Hamburg on 28 Apr 1980, pp. 56-59.

Clark, Carey A. Armor in the Hurtgen Forest: A Research Report. Committee 7, Officers Advanced Course, The Armored School, Fort Knox, KY, May 1949.

Coolidge, George W., COL. Visit to Ninth Army Armored Units, AGF Report No. 385 - Cavalry and Armored Report. Report of the War Department Observer Board - U.S. Forces European Theater, 27 Nov 1944.

Coolidge, George W., COL. AGF Report Number 693. Armored Notes. Report of the War Department Observer Board - U.S. Forces European Theater, 1 March 1945.

Davis, Ernest H. 180th Infantry, 45th Infantry Division, Venafro to Casale, Italy, 2 Nov 43-3 Jan 44. Monograph, WWII Operations, Fort Benning, GA: The Advanced Officers Course, 1946-50.

Department of the Army. Historical Study, Russian Combat Methods in World War II. DA Pamphlet, No. 20-230, Department of the Army, Nov 1950.

Department of the Army. Infantry Regiment, FM 7-40. Washington, D.C.: U.S. Government Printing Office, Jan 1950.

Department of the Army. The Infantry Battalion. FM 7-20. Washington, D.C.: U.S. Government Printing Office, Jun 1989. App E, pp. E 1-36.

Department of the Army. The Tank and Mechanized Infantry Battalion/Task Force. FM 71-2. Washington, D.C.: U.S. Government Printing Office. APPA, pp. A 1-6.

Department of the Army. Armor and Mechanized Infantry Brigade. FM 71-3. Washington, D.C.: U.S. Government Printing Office, May 1988, APPA, pp. A 1-6.

Department of the Army. Division Operations (Final Draft). FM 71-100. Washington, D.C.: U.S. Government Printing Office, 15 Nov 1988. APPA, pp. A 1-25.

Department of the Army. Corps Operations, FM 100-15. Washington, D.C.: U.S. Government Printing Office, 15 Nov 1988. Ch. 5, pp. 47-50; Ch. 6, pp. 36-39.

Department of the Army. Army Lineage Book, Vol. II, Infantry. Washington, D.C.: Office of the Chief of Military History, 1953.

Department of the Army. The Army Plan (TAP), FY 1992-2007. Washington, D.C., March 1990. An unclassified line from the 1990 document emphasizing force mix and interoperability.

Doubler, Michael D. Busting the Bocage: American Combined Arms Operations in France, 6 June-31 July 1944. Fort Leavenworth: CGSC, 1988.

Drea, E., DR. Comparison of World War II to Light Infantry Division 1986 Resupply Capabilities. In-house research for Director, Military History Institute, Carlisle Barracks, PA: March 1986.

Dunham, Emory. The Tank Destroyer History. Study No. 29, Headquarters Army Ground Forces, Washington, D.C., 1 Sep 1945.

Dyer, George. XII Corps, Spearhead of Patton's Third Army. Baton Rouge, LA. Printed by Military Press of Louisiana, Inc., 1947.

Eisenhower, D. D., MAJ. Tank with Infantry. Nine studies and memos, 1920--24.

Foley, Thomas C., MG. Armor 2000 - A Balanced Force for the Army of the Future. White Paper, Fort Knox, KY: U.S. Army Armor Center, 10 July 1990.

Glantz, David M., LTC. August Storm: Soviet Tactical and Operational Combat in Manchuria, 1945. Leavenworth Papers No. 8, Fort Leavenworth, KS: Combat Studies Institute, Jun 1953.

Godwin, Major. "Discrepancy in Light Infantry Missions and CSA Directives," The Infantry Conference Booklet, 1987.

Graham, Ralph W. Co. D, 757th Tank Battalion, Supporting 1st Motorized Division, French Expeditionary Corps, Radicofani, Italy, 17-18 June 1944. Monograph, World War II Operations, Port Benning, GA: The Advanced Officers Course, 1946-1950.

Greenfield, Kent. The Organization of Ground Combat Troops. Vol. I of the War Department, Sub Series I, of U.S. Army in World War II, Washington, D.C.: U.S. Government Printing Office, 1947.

Hastings, Henry S. Employment of Armored Infantry. Monograph, Armor Officers Advanced Course, Fort Knox, KY: The Armored School, 25 February 1947.

Hinson, Claude R. 755th Tank Battalion Supporting 3d Algerian Infantry Division, French Expedition Corps, Advancing on Rome, Italy, 11-20 May 1944. Monograph, World War II Operations, Fort Benning, GA: The Advanced Officers Course, 1946-50.

Holley, J. A., BG, and Fries, S. G., LTC. Organization, Equipment and Tactical Employment of Separate Tank Battalions. Study 50 of the General Board, U.S. Forces European Theater, 1946.

Hutcheson, John M., LTC. Pre-Rotational Brief, Light Infantry Observer-Controller Team. U.S. Army National Training Center, Fort Irwin, CA, Ed. 1 Apr 1989.

Kibler, A., BG, and Hartness, H. N., BG. Org ation, Equipment and Tactical Employment of the Infantry sion. Report 15 of the General Board, U.S. Forces Europe eater, 1946.

McMichael, Scott R. A Historical Perspective ight Infantry. Combat Studies Institute Research Survey 6, pp. 227-233.

Mellenthin, F. W. Von. Armored Warfare in World War II. Conference featuring General/Major F. W. Von Mellenthin, May 10, 1979. Columbus, OH: Battelle Columbus Laboratories, 1979.

Miller, Robert E. Separate Tank Battalion versus the Tank Regiment. A Research Report by Committee 28, Officers Advanced Course, The Armored School, 1951-52, Fort Knox, KY.

Military Operations Research Unit. Operation Goodwood. Extract Military Operational Research Unit (MORU), British Army Report No. 23, Oct 1946; Directorate of Army Training War Study, Operation Goodwood; British Staff College Battlefield Tour Booklet, Operation Goodwood.

Mitchell, Ralph M. The 101st Airborne Division's Defense of Bastogne. U.S. Army Command and General Staff College, Fort Leavenworth, KS, Sep 1986.

Montano, Jim, LTC. Operational Employment of Light Infantry Divisions. Fort Ord, CA, 6 Jul 1987.

Nenninger, Timothy K. The Development of American Armor, 1917-1940. Masters Thesis, University of Wisconsin, 19j68, pp. 55-83.

Ney, Virgil. Evolution of the U.S. Army Division, 1939-1968. Combat Operations Research Group Memo CORG-M-365. Fort Belvoir, VA: Combat Operations Research Group for U.S. Army Combat Development Command, Jan 1969.

9th Infantry Division. Reports on Combat Experiences and Battle Lessons for Training Purposes. 21 June 1943, U.S. Army War College Curricular Archives.

Nunn, Sam. U.S. Senator, Georgia. "A New Military Strategy," The Congressional Record - Senate. Washington, D.C.: April 18, 1990, p. 4453.

OCAFF. Notes on Combat in Korea. Fort Monroe, VA: OCAFF, 16 April 1952.

Palmer, Robert R., DR. Reorganization of Ground Troops for Combat, Study No. 8. Washington, D.C.: Headquarters Army Ground Forces, Historical Section, 1946.

Roberts, William E. New Guinea Campaign, 24 Jan 1943-31 Dec 1944. Monograph, World War II Operations, Fort Benning, GA: The Advanced Officer Course, 1946-1950.

Sawicki, James A., MAJ. Tank Battalions of the U.S. Army. Wyvern Publications, U.S. Army Military History Institute, Carlisle Barracks, PA.

Secretary of the Navy's Semi Annual Report. January-June 1953, Washington: U.S. Government Printing Office.

Uhle-Wettler, Franz, DR, BG. Battlefield Central Europe. A translation from Dr. Uhle-Wettler's book by the Liaison Office, U.S. Army TRADOC, FRG, 28 July 1980.

U.S. Army. 1st Armored Division After Action Reports and Histories of Component Units, 1944-45. Historical Documents, World War II Collection, The U.S. Army Military History Institute. Carlisle Barracks, PA.

U.S. Army Armored School. A Critical Analysis of the History of Armor in World War II: Research Report by Committee of Students. Fort Knox, KY, April 1953, 107 pages.

U.S. Army Armored School. Officer Advanced Course, 1948/49, Committee No. 1. Mud, Mountains and Armor: The 1st Armored Division from Rome to the Alps. Fort Knox, June 1949.

U.S. Army Command and General Staff College. Combined Arms Actions since 1939. Fort Leavenworth, KS, October 1975.

U.S. Army Command and General Staff College. Heavy/Light Operations. DA DCSOPS Briefing Center for Army Tactics, Fort Leavenworth, KS, 1988.

U.S. Army Command and General Staff College. Heavy/Light Operations. Field Circular No. 71-101-3. U.S. Army Command and General Staff College. Fort Leavenworth, KS, 23 March 1987.

U.S. Army Command and General Staff College. "No Margin for Error." Combined Arms Actions since 1939. U.S. Army Command and General Staff College, October 1975.

U.S. Army Ground Forces. The Organization of Ground Combat Units. U.S. Army in Worald War II, Washington, D.C.: Historical Division, Department of the Army, 1947.

U.S. Army Ground Forces. The Tank Destroyer History. Washington, D.C.: Army Ground Forces Study No. 29, 1946.

U.S. Army Ground Forces Observer Board. AGF Study No. 27, The Armored Force Command and Center. Washington, D.C., 1946.

U.S. Army Ground Forces Observer Board. Report of Observers ETO 1944-1945, Vol. V, AGF Report No. 1120. Tactics, Organization, and Equipment, 7th Armored Division. Training Memorandum No. 7. "Tank-Mounted Infantry." Washington, D.C.: Army Ground Forces, 9 February 1945, pp. 1-7.

U.S. Army Ground Forces Observer Board. Report of Observers ETO 1944-1945, Vol. II, AGF Report No. 191, Notes on Interviews with Commanders in Normandy. Washington, D.C.: Army Ground Forces, 20 August 1944, p. 6.

U.S. Army Ground Forces Observer Board. Report of Observers ETO 1944-1945, AGF Report No. 1000, Separate Tank Battalion. LTC Joseph G. Felker, 153rd Tank Battalion, Washington, D.C.: Army Ground Forces, 31 May 1945, pp. 1-2.

U.S. Army Ground Forces Observer Board. Report of Observers ETO 1944-1945, Vol. V, AGF Report No. 948, Observation of an Infantry Division Commander, MG Leland S. Hobbs, 30th Infantry Division. Washington, D.C.: Army Ground Forces, 14 May 1945, p. 1.

U.S. Army Ground Forces Observer Board. Report of Observers: Mediterranean Theater of Operations, Vol. V, 8 Jan-25 Apr 1944. Washington, D.C.: The War Department, 1944.

U.S. Army, Military History Institute. Experiences in Division Command, 1986. Division Command Lessons Learned Program, Carlisle Barracks, PA, 1986.

U.S. Marine Corps. The Marine Air-Ground Task Force Operational Handbook 2. Quantico, VA, 2 March 1987.

U.S. War Department, General Staff. Operations Division Information Bulletins (OPDIB). Washington, D.C.: Office of the Chief of Staff, Vol. I, No. 1, 20 January 1944.

U.S. War Department Military Intelligence Division. Order of Battle of the German Army. Washington, D.C.: 1 March 1945.

Van Creveld, Martin. Military Lessons of the Yom Kippur War. Washington Paper, No. 24. Center for Strategic and International Studies, London: Sage Publications, Inc., 1975.

Vetock, Dennis J. Lessons Learned: A History of U.S. Army Lesson Learning. Carlisle Barracks, PA: U.S. Army Military History Institute, 1988.

War Department. Employment of Tanks with Infantry. FM 17-36, 7 Feb 1944, Supplement 1.

War Department. Infantry, Tank Board: Army Regulation 75-60, 30 April 1926.

War Department. Infantry Field Manual: Rifle Battalion FM 7-20, 28 September 1942. Washington, D.C.: U.S Government Printing Office, 1942.

War Department. Infantry Battalion War Department Field Manual, FM 7-20, 1 October 1944. Washington, D.C.: U.S. Government Printing Office, 1944.

War Department. Organization, Equipment and Tactical Employment of the Armored Division. Study 48 of the General Board, U.S. Forces European Theater, 1946.

Wickham, John A., GEN. Light Infantry Divisions in Defense of Europe. NATO's Sixteen Nations, Special Report 1/85, Brussels: pp. 103-107.

LECTURES

Burba, E. H., GEN, FORSCOM Commander, Implementing National Military Strategy, Lecture. Carlisle Barracks: U.S. Army War College, 16 January 1991.

Grazioplene, James, LTC. Operation Just Cause Observations. A presentation to Light Forces Conference, Fort Knox, KY: The Armor School, 27 February 1990.

INTERVIEWS

Balck, Hermann, GEN. Translation of taped conversation with General Hermann Balck, 12 January 1979. Columbus, OH: Battelle Columbus Laboratories Tactical Technology Center, January 1979.

Dyson, James H., COL. With the 2nd Armored Division from Benning to Berlin. An interview with LTC(P) John Hutcheson, Beaufort, SC, 22 December 1990. COL Dyson served with the 2nd Armored Division as an artillery battery commander and forward observer.

Frederick, Robert T., MG. MG Robert T. Frederick, Interview at the Pentagon, 7 January 1949, transcript on file in Archives, U.S. Army Military History Institute, Carlisle Barracks, PA.

Roland, C. P., DR. Cooperation with Tanks and the Louisiana Maneuvers. An interview with LTC(P) John Hutcheson, Carlisle Barracks, PA: October 1990. Dr. Roland served with the 99th Infantry Division as a combat arms officer.

THESES, STUDIES AND MEMORANDA

Caldwell, William B., IV, MAJ. Not Enough to Get There, Not Heavy Enough to Win: The Case of U.S. Light Infantry. Fort Leavenworth, KS: SAMS Monograph, 4 December 1987.

Crawford, Howard W., Jr. Joint Readiness Training Center (JRTC) Training Observations Implications for Senior Army Leader Training. A military studies project, Carlisle Barracks, PA: The U.S. Army War College Library, 1990.

Gavitt, James S., MAJ. Considerations for the Distribution of Anti-Armor Weapons. Fort Leavenworth, KS: SAMS Monograph, 20 May 1985.

Foley, Thomas G., MG. Memorandum: Armor Support to Light Forces, 23 April 1990. Fort Knox, KY: U.S. Army Armor Center and School.

Harvey, Benjamin, MAJ. Feedback from Visits and Conversations with the United States Army Light Divisions. Memorandum for the Commanding General, Fort Benning, GA, 15 October 1986.

House, Jonathan M., CPT. Towards Combined Arms Warfare: A Survey of Tactics, Doctrine and Organization in the 20th Century. Fort Leavenworth, KS: Combat Studies Institute, August 1984.

Hutcheson, John M. Armor Support to Light Forces, Conference, 27 Feb-1 Mar 1990. Memorandum for Commander, Operations Group, National Training Center, 6 March 1990.

Luttwak, Edward N. The U.S. Army of the Second World War: The Light Divisions. Historical analysis and projection for Army 2000. Vol. I, Part 1. U.S. Army TRADOC, Fort Monroe, VA, 1 June 1982.

McPerren, Carl D., LTC(P). Heavy/Light Lessons Learned, Pinon Canyon, 21 Oct-11 Nov 1989. Unpublished enclosure to 4th Battalion, 9th Infantry, After-Action Report to a 4th Infantry Division maneuver in preparation for a National Training Center rotation.

Moon, James M., CPT. Heavy/Light Operations: Considerations to Optimize the Capabilities of Both Units. CATRADA/CACDA Draft 1987.

Saint, Crosbie, GEN. Memo for General Carl E. Vuono: FTX Certain Challenge 1988. 20 December 1988.

Second Armored Cavalry Regiment. A Synopsis of 2d ACR Action and Lessons Learned during Exercise Certain Challenge '88.

Watts, Ronald L, LTG. Memo for GEN Saint, Reforger, '88. 18 November 1988. VII Corps Headquarters, APO NY 09107-0200.