This report summarizes the operations and training aspects of the evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV) conducted during the period 6 January to 28 March 1967. I consider it a helpful guide for use by units and individuals fighting in Vietnam or who, at some future time, may join in that fight.

Although oriented on U.S. Army Mechanized Infantry, Tank, and Armored and Air Cavalry, it is of interest to all engaged in the common purpose of defeating the enemy we face in South Vietnam today.

This report supplements previously published training literature dealing with operations in the Republic of Vietnam. The final story of mechanized infantry, tank, and cavalry operations in Vietnam is still being written—lessons are being learned and new techniques developed during every operation. Each of us must continue to display imagination, resourcefulness, and ingenuity in our training and combat operations.

W. C. Westmoreland
General, United States Army
Commanding
A detailed evaluation of U.S. Army mechanized infantry, tank, armored cavalry and air cavalry units in the Republic of Vietnam (RVN) was conducted during the period 6 January 1967 to 28 March 1967. This in-country evaluation titled "Evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV)" was directed by the Department of the Army based on a requirement from the Chief of Staff, U.S. Army, to determine whether a pattern for mechanized infantry and armor operations was emerging in RVN. The Commanding General, U.S. Army Combat Development Command (USACDC) in coordination with the Commander in Chief, U.S. Army Pacific (CINCUSARPAC) and the Commanding General U.S. Army Vietnam (USARV) prepared the study plan which was approved by the Department of the Army in December 1966. The study mission was assigned to CGUSARV and was conducted by the MACOV Study Group, headed by Major General Arthur L. West Jr. One of the tasks which the study was required to address was to evaluate the tactics, techniques, and operations of U.S. Army mechanised infantry, tank, and armored and air cavalry units in the Republic of Vietnam to determine what changes in doctrine and training are required. This report presents the results of that portion of the study relating to this task. This training and information document is designed to be instructive in nature and primarily for the benefit of troops assigned to mechanised
infantry, tank, and armored and air cavalry units and to training centers and service schools charged with their training. It does not replace current doctrine, tactics, and techniques but rather expands on them as applied in the operational environment in the Republic of Vietnam.

Due to the critical role of terrain and ground mobility in any evaluation of armor and mechanized forces, careful attention was given to the examination of military operations in each geographic region within RVN during both of the monsoon seasons. It was recognized that the MACOW evaluation took place in weather conditions favorable to armor and mechanized movement in most of RVN; therefore, considerable effort was devoted to documenting movement capabilities in all seasons.

There was no intent in the MACOW study effort to review and report in detail on the enemy situation or the overall physical geography of Vietnam. However, great attention was given to those characteristics of the enemy, terrain and climate which impacted on the use of armor and mechanized forces. The subject of tactical movement, in particular, was treated in significant depth.

The character of the war in RVN varies significantly from region to region, reflecting the many factors which are peculiar to each of the four CTZ. Although terrain and weather imprint a peculiar and characteristic signature in each tactical zone, other factors are present, and to a considerable degree exert equal or greater influence. In the I CTZ, in the north, the bulk of the population live along a narrow 15 mile strip of coastal rice growing land. The U.S. Marines, employing Marine Corps doctrine, tactics, and techniques have concentrated in this area and along the Demilitarized Zone (DMZ) to counter the infiltration threat.

In the II CTZ, the broad expanse and extreme variations in terrain, the heavily populated rice growing coastal plains in the east, the rugged central belt of the Annamite Mountains covering 64 percent of the CTZ, and the thickly forested highlands in the west, present a major requirement for force mobility. Strong main force North Vietnamese Army (NVA) units and a primary infiltration route through Laos and Cambodia combine to present a significant enemy threat.

The III CTZ, containing the major population center of Saigon, the political heart of RVN, is flanked by dense mangrove swamps and extensive piedmont jungle growth. The hardcore enemy units, predominantly Viet Cong, have developed a series of long established base areas and a deeply intrenched infrastructure.

In the IV CTZ, primarily an ARVN area of operations, a dense population, flat rice paddy terrain, heavy mangrove swamps and the tactics employed by the enemy, make operations in this area separate and distinct from the other three CTZ.

Forces on the one hand must concentrate on total destruction of the enemy and his infrastructure and provide for complete displacement of the civilian population (e.g. OPERATION CEDAR FALLS in the Iron Triangle), while in contiguous areas, as throughout
the Mekong Delta, operations may be characterized by numerous small unit actions which have as their combined purpose the defeat of the enemy and the establishment of fertile ground for revolutionary development. In this latter mission, the role of the Regional Forces (RF) and Popular Forces (PF) elements of the Republic of Vietnam Forces (RVNAF) are paramount and must be fully considered in developing a rational basis for U.S. Force employment.

As an adjunct to this training document, a training film, "U.S. Army Mechanized and Armor Combat Operations in Vietnam," is now being completed using combat film footage, and will be issued through normal film distribution channels. A draft field manual on Air Cavalry Operations has also been prepared and informally coordinated with the 1st Cavalry Division (Air Mobile). It will be published by U.S. Army Combat Development Command and will be distributed to air cavalry units and service schools.

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CONCLUSION
SECTION I
INTRODUCTION

1. PURPOSE
The purpose of this report is to set forth the results of the evaluation of U.S. Army Mechanized and Armor Combat Operations in Vietnam (MACOV) that are of training interest. It is oriented on mechanized infantry, tank, armored cavalry, and air cavalry units. It is designed to be instructive and primarily for the benefit of troops assigned to these type units and training centers and service schools charged with their training. It does not replace current doctrine, tactics and techniques but rather expands on them as applied in the environment of the Republic of Vietnam.

2. SCOPE
This report is oriented on mechanized infantry, tank, armored cavalry and air cavalry units in the Republic of Vietnam. The first section covers the nature of the enemy and an evaluation of the terrain in the various parts of the country as it affects the operations of these type units. The next section deals with doctrine, tactics, and techniques with illustrated examples of how they are applied in typical combat situations. The final section deals with organizational structure and equipment and includes a rationalization of deviations from standard TOE and other innovations and modifications.
3. THE NATURE OF THE ENEMY AND HIS OPERATIONS

NVA forces are better armed, equipped, supplied and led than other VC units. NVA forces usually wear distinctive khaki uniforms and exhibit a greater tendency to maintain unit integrity particularly when forced to withdraw. Because of these factors and his relative unfamiliarity with South Vietnam he can not blend into the local population as VC units frequently do. These considerations also tend to limit NVA operations to those regions in close proximity to sanctuary or in which he can escape detection during the hours of daylight. Despite the foregoing many similarities in VC methods of operation are apparent. The simple but effective code of the VC is "When the enemy advances, withdraw; when he defends, harass; when he is tired, attack; when he withdraws, pursue." This maxim emphasizes the difficulty with which he can be found, fixed, fought and finished. VC tactics and techniques rely on speed, security, surprise and deception for their success. Operations are planned in great detail and are based on thorough, detailed reconnaissance. Sand tables, terrain models and rehearsals are used whenever possible in preparing troops for tactical missions. This practice tends toward a certain amount of inflexibility, since radio communications are usually limited to one short range portable radio per battalion. They generally prefer to break contact when a large operation fails to be executed according to plan rather than change operations in mid-stream. They appear to be reluctant to attack units strong in armor or mechanized equipment and those units which have demonstrated skill in employing air and artillery support.

a. OFFENSIVE TECHNIQUES. The ambush is a common VC offensive technique. Detailed planning and meticulous preparation are always in evidence; they have been known to let an opportunity slip by rather than act hastily. Command detonated mines are usually employed to fix the target in place. Then after a short and violent attack, the ambushing forces make a rapid withdrawal. The usual target is people, not supplies. Raids are another common offensive technique. The surprise raid takes as much advantage as possible of lax security. It is usually short and aimed at a larger force. Larger power raids employ overwhelming strength and maximum firepower and are designed to quickly overrun and annihilate the defenders. Maximum use is made of darkness and poor weather conditions to minimize the effects of artillery and air fire support. Harassment is one of the tenets of VC guerilla warfare and is practiced wherever conditions permit. Sniper fire, mines, booby traps, grenades, mortars, recoilless rifles and even spiked traps and poison arrows are employed. The VC are adept at infiltration for the purpose of sabotage, assassination, demoralization and the collection of intelligence. The following explanation of VC offensive techniques was furnished by the Ambush Academy, 25th Infantry Division:

The technique, "One Slow, Four Quick" is used by the Viet Cong in their battle planning for assault against built up defensive positions or for ambush of moving columns of vehicles or dismounted troops.
Studies of these steps reveal that the Viet Cong in the first step, that of "PREPARE SLOWLY," believe in thorough and deliberate planning before undertaking any tactical operation. They do not usually undertake an operation that does not have a very good chance of succeeding. In this step the Tactical Commander formulates his plans, studies the strength and weakness of the enemy, evaluates the terrain, makes a ground and map reconnaissance of the area of tactical operation and plans his routes to and from his objective. Then the Viet Cong leader withdraws to the rear in a relative secure area. Here he organizes his tactical elements and chooses a rehearsal site. This must be as near like his planned objective as possible. Here he rehearses the operation until every leader and individual is familiar with the terrain, his specific job and only then, when the Viet Cong Commander is convinced that the rehearsal is perfect does he decide to execute his planned operation.

THE FOUR QUICK STEPS. This is the execution of the operation and in the first quick step "ADVANCE QUICKLY." The Viet Cong element moves from their relatively secure area and advances quickly without delay to minimize their desired objective. Then they immediately as planned go into the second quick step "ASSAULT QUICKLY." In this, the assault phase, they use to maximum advantage the element of surprise and mass a large volume of automatic rifle fire, recoilless rifle fire or rifle grenade fire on their objective or upon the lead element of a vehicular or dismounted column to halt and disorganize it. They then exploit their success and pursue the enemy killing or capturing him.

At this time the Viet Cong executes the third quick step and "CLEARS THE BATTLEFIELD QUICKLY." In this phase he collects and carries off for future use all of the weapons, ammunition and explosives he can carry and destroys anything of value left behind. He evacuates his wounded and religiously carries off his dead.

He then, with orderly precision, advances into the fourth quick step of "WITHDRAWS QUICKLY." He moves out over planned withdrawal routes ready to use alternate routes if necessary and his tactical elements quickly breakdown into smaller elements and lose themselves over as large an area as possible.
b. DEFENSIVE TECHNIQUES. Defensive techniques are centered around methods of escaping from all forms of attack by stronger forces. In general, the defense is one of delay until a rapid withdrawal from contact can be made. Once contact is broken, the VC either go into hiding or exfiltrate to pre-arranged rallying points. Capture is evaded by blending with the local population, melting into dense jungle areas or by literally going underground into elaborate and well-concealed tunnel systems. The VC prepare extensive defensive systems throughout their areas of operation, and these are characterized by defense in depth, mutual support, overhead cover and maximum use of cover and concealment.

c. ANTITANK TECHNIQUES.
(1) General. Although the VC cannot be said to possess a sophisticated antitank capability, they make effective use of weapons and materials available to them. The primary antitank weapons consist of the 57mm and 75mm recoilless rifles, antitank grenade launchers (RPG2 and RPG7) and at times the 12.7mm machine gun. Antitank mines vary from pressure detonated devices similar to the U.S. antitank mines through various improvised mines which may be as much as 250 lbs in size. They also use recovered artillery and mortar shells and aircraft bombs with pressure or command detonated fuses. Figures 1 through 4 illustrate typical VC antitank weapons and mines.

(2) Offensive Use. The most frequent offensive use of antitank weapons is in conjunction with ambushes. They are usually emplaced at each end of the ambush area where they can attack the first and last vehicles in the killing zone and also protect the flanks of the position. They will also be placed at intervals throughout the killing zone. These weapons will have designated alternate positions to which they can be moved to protect the rear of the ambushing force against encirclement by mobile forces. Command detonated mines are also employed at the ends of the killing zone to knock out vehicles and block movement out of the zone. Claymore antipersonnel mines are frequently placed in trees for the purpose of injuring personnel riding on top of vehicles and crewmen who are partially exposed. Enemy personnel will also position themselves in ditches along side the road three to five meters from the passing armored vehicles. They attempt to take advantage of the dead space around APC's and tanks where automatic weapons cannot be sufficiently depressed to engage them. From this distance the enemy attempts to throw hand grenades into the tracks of the vehicle and to throw grenades into the driver and fighting compartment hatches. They will also tie two or three hand grenades together and attempt to lodge them on top of the vehicles in the hope of penetrating the thinner armor. One defense against such tactics is the use of hand grenades dropped over the side of the vehicle. Care must be taken, however, to throw the grenade far enough away from the enemy that he cannot pick it up and throw it back before it explodes. Another solution is mutual support by two or more vehicles in order that one
vehicle can use its automatic weapons to protect the other. Only when conditions are highly favorable will an attack be made against an armor unit unless they can find an isolated platoon or less which they can engage by hit and run tactics. For a short period they will employ all possible means to destroy the armor vehicles including recoilless rifles, antitank grenade launchers, hand grenades and satchel charges. Once they have lost the advantage of surprise and are in danger of being defeated, they withdraw. Nuisance type mining is the most frequent method of offensive antitank warfare. Mines will be emplaced at night in roads that are well traveled during the day. Often large command detonated mines will be emplaced during the hours of darkness. They will also emplace mines on trails which may not have been used for some time. There have been occasions when pressure fused mines did not explode until after several vehicles had passed over them and so were thought to be command detonated. Investigation of other mines found in the vicinity usually indicated that mud had become hardened under the spider of the mine and the vehicle which eventually exploded the mine was one having a higher ground pressure than those that had previously passed over the mine, often a heavily loaded vehicle.

(3) Defensive Employment. Antitank weapons can be expected in any defensive position. They are rapidly moved to that portion of the position being threatened by armored elements. No particular technique has been discerned in their employment except that they are employed at close ranges, usually less than 50 meters. Mines are also employed in the vicinity of organized defensive positions and base camp complexes. They are not always placed on roads or trails but may be found randomly emplaced in fields and open areas of the jungle.

(4) Logistical Support. The VC relies on the local population for food, clothing and manpower. NVA provides weapons, ammunition and some manpower. Supplies are also received from out-of-country sources in contiguous areas and from Red China.

(5) Strengths and Weaknesses. VC strengths lie in his ideological dedication, his toughness and endurance, a thorough intelligence system and a high degree of foot mobility. His weaknesses stem from his lack of a sophisticated war machine. He is highly vulnerable to air, artillery and armor attack and has none of these capabilities at his own disposal. He lacks communications and has a limited logistical capability for the support of sustained operations.

4. FRIENDLY FORCES. Friendly forces in RVN consist of U.S. Forces, Free World Military Assistance Forces (FWMAF), and the Republic of Vietnam Armed Forces (RVNAF).

a. FREE WORLD MILITARY ASSISTANCE FORCES (FWMAF). FWMAF forces consist of representative units or contingents from Australia, New Zealand, Thailand, Korea, The Republic of China and the Philippines. Tactical FWMAF, at the present time, are limited to the nations of Australia, New Zealand and the Republic of Korea.
b. Republic of Vietnam Armed Forces. The vast majority of RVNAF are in the Army which is deployed in all four CTZ. The Army of Vietnam (ARVN) is divided into regular army forces, regional forces, and popular forces. Regular ARVN units make up the largest single component. Regional Forces (RF) operate as province forces under control of the chief who is usually a major or lieutenant colonel of the regular component. Popular Forces (PF) operate at the hamlet or village level and have the mission of defending the hamlet or village they actually inhabit. RF reinforce PF when hamlets defended by the latter are in danger of being overrun. Republic of Vietnam Navy, Marine and Air Forces account for slightly more than ten percent of the total RVNAF.

5. ENVIRONMENT

a. GENERAL. South Vietnam occupies a crescent-shaped area of about 67,000 square miles on the southeastern edge of the Indochina Peninsula. It is only 45 miles wide at the 17th parallel along the demilitarized zone (DMZ). It has 1,500 miles of seacoast on the South China Sea and the Gulf of Siam. Its western border with Laos and Cambodia measures about 950 miles. Land borders, for the most part, are poorly defined and are drawn through areas difficult of access.

b. CLIMATE AND WEATHER

(1) Climate. The climate is hot and humid, subtropical in the north and tropical in the south where the mean monthly temperature is about 80 degrees Fahrenheit. Temperatures
frequently soar well over the 100 degree mark in parts of the lowlands and delta region. Annual rainfall is heavy in most regions and is profoundly influenced by the monsoon winds throughout the year. Rainfall is heaviest in the north along the coast where the annual average is 128 inches. At Saigon, rainfall averages 80 inches annually.

(2) Weather. There are two distinct seasonal alterations which influence the weather throughout the year. These are the summer, or southwest monsoon and the winter, or northeast monsoon. Monsoon means a periodic wind and are referred to by the direction from which they flow. The dividing line between the influence of the two monsoons is the highlands formed by the Annamite Mountain Range (Figure 5). The southwest monsoon begins in May and lasts through September. Its influence continues to be felt during the transition period which lasts into December. The monsoon brings in warm moist air which is gradually forced upward against the highlands. The cooler temperatures at the higher altitudes cause the moisture to condense and fall as rain. In the area influenced by the southwest monsoon rainfall is heaviest in the north and grows progressively lighter to the south. The northeast monsoon begins during the transition period of the southwest monsoon. It usually begins in September, is firmly established by November and lasts through December. Rains accompanying the northeast monsoons are heaviest in the area north of Da Nang ranging from 80 to 120 inches annually. Rainfall tapers off further south averaging 55 inches at Nha Trang and less than 40 inches between Phu Thiet and Phan Rang. Rains begin in September and last into February in the northern portion. Farther south rainfall ends in January.

c. TRAFFICABILITY

(1) General. The treatment of the "going" in subsequent paragraphs is, of necessity, general in nature. It is designed to provide a general understanding of the nature of the terrain as it affects all forms of movement. More about the going is being learned every day as mechanized infantry, armor and armored cavalry units penetrate areas of operations in which these type units have not been employed previously. Much more remains to be learned. In some areas it is impractical to expend the engineer effort necessary to move armored units, in other areas armor can move with ease. Between these extremes conditions vary widely in different parts of the country and at different times of the year. Wheeled vehicles are essentially restricted to roads and trails throughout the country. While much of the ground becomes firm enough to support wheeled vehicles during the dry season, the numerous obstacles such as; paddy dikes in the coastal plains, dense vegetation, and steep slopes in the highlands, and dikes, ditches and canals in the delta makes cross-country movement of wheeled vehicles infeasible. The M578 light recovery vehicle, because of its greater weight and lack of a swim capability cannot operate in many areas readily accessible to the M113. The subsequent evaluation of the terrain as it affects tactical movement does not specifically address this type vehicle. The M551
(Sheridan tank) was designed to have the same mobility characteristics as the M113. Tests conducted in CONUS to date indicate the design characteristics have been achieved.

(2) Evaluation of the "Going". Following is a list of "pointers", gathered from many sources in RVN, which have proven helpful in evaluating the going capability of the soils found in the various parts of the country:

(a) Soils composed of red clayey silt, common in the area around Tay Ninh, the plateau region of II Corps Tactical Zone (CTZ), and found locally throughout the country tend to break down when wet. Single tracks may usually be made but repeated passes or sharp turns cause these soils to break down and become untrafficable. Similar conditions often exist in plantation areas where tracking is not advisable during the wet season. One way to test for this type soil is to stick a rod (such as the one found in a box of tank ammunition) into the ground where surface water is standing. If the water drains through the hole, clay is usually present and tracking is not advisable during the wet season.

(b) Watch the water buffalo. He does not go where he can not stand on the bottom. If the bottom supports him it will usually support an APC.
(c) Rice paddies without standing water during the rainy season are too soft to support APC. Those containing clear water and green vegetation are usually trafficable for APC. During the dry season all rice paddies are assumed to be trafficable for APC.

(d) Inundated areas containing yellowish reeds and cloudy water can be expected to have a soft bottom.

(3) Corps Tactical Zones (CTZ). The Republic of Vietnam (RVN) is divided into four Corps Tactical Zones (Figure 6). Conditions of weather, climate and terrain vary between each of these although some common characteristics can be found. For these reasons the terrain and its impact on tactical movement will be treated separately in each of the four zones.

(4) The I Corps Tactical Zone (CTZ) (Figure 7). The I CTZ covers 11,100 square miles or approximately 17 percent of the total land area of RVN. It is divided into five governmental provinces with a total population of approximately two million people or less than 15 percent of the national total. Most of the population inhabit the coastal lowlands. The majority of the land area within the I CTZ consists of the Highland Region which is formed by a chain of rugged mountains, extending the length of the zone from north to south. This area is characterized by steep, rocky slopes; sharp crests and deep narrow valleys. The vegetation in these mountains is the most dense found in RVN and consists of tropical evergreen forests. The remainder
I CORPS

DRY SEASON

KEY:
NO GO, TK-APC
GO, TK-APC

Figure 8. Dry Season Going, I Corps

I CORPS

Figure 8. Dry Season Going, I Corps

of the CTZ, the Coastal Lowlands, is a narrow flat plain that extends from the sea to the foothills of the mountains. This area is characterized by sandy beaches and large areas of ricefields. Rains begin in September and reach a maximum in October and November. Rainfall is heaviest in the Hue area and generally lasts into February. Dry months are from February through August. Due to the porous nature of the soil heavy rains do not affect trafficability after a few sunny days.

(a) Dry Season (Figure 8)

1. Tank Movement. While 44% of the total terrain in the CTZ can be negotiated during the dry season, movement is considered best in the coastal lowlands where over 89% of the terrain is trafficable. During this season, the ground in the coastal lowlands is firm, and supports free tank movement across all but small, isolated marshy areas, and some rice fields adjacent to rivers. Average rate of movement for tanks is 8-10 kilometers per hour. The rivers and numerous streams will, however, reduce the movement rate as their soft soil bottoms generally do not have sufficient bearing strength to support tanks. Class 60 rafts, bridges or armored vehicle launched bridges would be required at crossing sites. The remaining 11% of the terrain in the coastal lowlands consists of isolated peaks and spurs with steep slopes and sharp ridges, covered with dense evergreen forests. The mountains in the highland portion of the CTZ pose the most severe restriction to tank movement and comprise 70% of the terrain in the
Figure 9. Typical Mountain Terrain, I Corps

Figure 10. Wet Season Going, I Corps
These mountains have slopes from 40 to 60%, and some cliffs. The combination of steep slopes and dense vegetation limits tank movement through the mountains to roads, trails, or stream valleys, unless engineering support is provided to improve the terrain (Figure 9). The numerous stream valleys and passes comprise 21% of the total terrain in the highland area. Cross-country movement can be made in some mountain areas, but would require extensive engineer assistance. Average rate of movement in the mountains does not exceed one kilometer per hour.

2. M13 and M551 Movement. Movement during the dry season is essentially the same as for tanks. Since these vehicles can swim they will not require bridging assistance in river crossings, but will have to use normal field expedients in exiting the steep, soft-soil banks. Average rate of movement is 10 to 12 kilometers per hour in the coastal lowlands and about the same as for tanks in the mountain regions.

2. Foot Movement. Foot movement in the coastal lowlands is essentially unrestricted during the dry season. The combination of steep, rock-covered slopes, and dense vegetation in the highlands restricts foot movement generally to trails and stream valleys. Average rate of movement varies from .2 to .5 kilometers per hour in the mountains to 2 to 3 kilometers per hour in the coastal lowlands.

(b) Wet Season (Figure 10)

1. Tank Movement. During the wet season, additional soft-soil areas reduce the amount of negotiable terrain in the CTZ to 36%. The soft-soil and inundated areas generally restrict tank movement in the coastal lowlands to roads, sandy beaches, or higher elevations. Tank movement along the roads will normally require bridging assistance, since bridge classifications are frequently less than 20, and the bypasses currently in use are of the low water type. During this period of restricted movement, it may be advantageous to move tanks along the coast by LST. The wide sandy beaches are fully suitable for amphibious landings permitting tanks to be employed along the entire coast. The average rate of movement is reduced to 4 to 5 kilometers per hour. Tank movement is not feasible in the mountains.

2. M13 and M551 Movement. Movement during the wet season is essentially the same as during the dry season. The low ground pressure of these vehicles and their ability to swim enables them to negotiate 89% of the terrain in the coastal lowlands perennially, but the average rate of movement is slowed to 4 to 5 KM per hour. In the highland area some of the stream valleys become inundated and the river velocities exceed the swimming speed of the M13. Crossing of these rivers may require engineer assistance. M13 and M551 movement is not feasible in the mountain regions.

2. Foot Movement. Foot movement during the wet season becomes difficult in the coastal lowlands due to soft-soil and inundated areas, rate of movement is reduced to
one to two KM per hour. Foot movement may be facilitated by using the swim capability of the M113 in those areas where stream velocities will permit. Rate of movement in the highland mountains is less than .2 KM per hour.

(c) Air Movement. The steep mountainous terrain in most of I CTZ plus the limited road net, makes air movement a necessary element to the conduct of operations. Helicopters thus provide the most effective means of movement in the mountains throughout the year and enjoy their greatest advantage during the wet season when the passes and river valleys become inundated. During the rainy season, helicopter operations are best conducted after the early morning fog and after low cloud cover has dissipated. The coastal lowlands contain many flat areas relatively free of vegetation, thus providing excellent landing sites year-round. Air movement in the coastal lowlands is not as vital as in the mountains because these areas are also best for APC's and tanks.

(5) The II Corps Tactical Zone (Figure 11). The II CTZ covers 29,500 square miles or approximately 45 percent of the total land area of RVN. It is divided into 12 governmental provinces with a total population of approximately 2½ million people. Over two-thirds of this population is located in the coastal provinces. The topography within the II CTZ is divided into three basic regions. The Coastal Lowlands consisting of a series of flat river plains which are bisected locally by spurs
of the Annamite Mountains that extend to the sea. The area is characterized by sandy and silty beaches, wide flat-floored river valleys, marshes and ricefields (Figure 12). The Highland Region is formed by a chain of mountains and rugged hills which form a crescent, its ends anchored on Cambodia and Laos, its center backing the coastal lowlands. The area is characterized by steep, boulder-covered slopes; sharp crests; and deep, narrow valleys. Vegetation consists of dense tropical evergreen forest. Scattered patches of smaller trees and clearings can be observed but forming no pattern they are not tactically significant. The Plateau Region is located between the mountains and the Cambodian border. It is characterized by rolling terrain, with hilly areas in the extreme northern and southern sections. Vegetation is generally a mosaic of cultivated fields, grassy areas, bamboo and secondary forests. Dense evergreen forests are found in the hill areas. The II CTZ has two distinct weather regions with the Annamite Mountain range separating the eastern and western climates of the CTZ. The monsoon influence is determined largely by the topographical features of the region. During the southwest monsoon season, rains are released, as winds from the southwest cross the Plateau and the western half of the mountains. As the air descends on the eastern side of the mountains, drying and heating takes place causing fair weather to occur along the coast. During the northeast monsoon season rain predominates on the eastern
side of the mountains, while the western half experiences dry weather.

(a) Dry Season (Figure 13)

1. Tank Movement. A shift of forces within the CTZ corresponding to the dry seasons will allow tanks to negotiate 55% of the terrain without assistance. Movement is best in the coastal lowlands from March into September when the ground is firm and the rice paddies are dry. The ground in the western plateau region is firm enough to support tank movement year-around, but many of the streams become too deep to ford during the wet season. Operations are best in the Plateau region starting in November and extending into July. The remaining 45% of the terrain within the CTZ is mostly mountainous and can only be traversed along the limited roads, cart trails and foot paths, which usually follow lines of least resistance. Movement can be made across the mountains but will require extensive engineer assistance. Rates of movement in the mountains and in the coastal lowlands are the same as in I CTZ. The average rate of movement in the Plateau region is 15 to 22 KM per hour.

2. M113 and M551 Movement. The same obstacles that affect tank movement during the dry season also serve to restrict M113 and M551 movement. These vehicles cannot penetrate the same amount of vegetation as the M48A3 tank. It is advisable to use tanks to clear paths for these
vehicles through the dense evergreen forests located in the northern and southern hill sections of the Plateau region. Rates of movement in the highland mountains and coastal lowlands are similar to those in I CTZ. The average rate of movement in the Plateau region is 15 to 25 kilometers per hour.

2. Foot Movement. Foot movement in the Coastal lowlands and through the open areas in the Plateau region is essentially unrestricted during the dry seasons, but is considerably slower than the tracked vehicle movement. The dense evergreen forests in sections of the Plateau region and throughout the mountains present a major obstacle to foot troops who must use existing trails, or cut paths through the underbrush. Tracked vehicles can be used to advantage to clear paths for foot troops, and thus increase their speed of movement. Rates of movement in the highland mountains and coastal lowlands are the same as in I CTZ. Foot movement in the Plateau region averages 2 to 3 KM per hour.

(b) Wet Season (Figure 14)

1. Tank Movement. The major restrictions to tank movement during the wet season are the many streams and rivers throughout the entire CTZ. The majority of these streams become too deep to ford, and will require AVLB's and engineer bridging to support waterway crossings during this period. The rice paddies in the coastal lowlands become too soft to support tank movement; however, they are shown to be trafficable because
of the many roads and trails which can be used to traverse them during the wet season. Bridging assistance will be required on these roads due to the limited bridge capacities. Rates of movement in the Plateau region are reduced to 8 to 15 KM per hour. Rates in the coastal lowlands are 4 to 5 KM per hour. Movement in the mountains is not feasible during the wet season.

2. Mil3 and M551 Movement. The waterways also serve as a restriction to the Mil3 and M551 movement during the wet season. Water velocities in the Plateau reach highs of 7.5 mph, which far exceed the swim capability of these vehicles. High water velocities adversely affects swimming control of these vehicles, additional engineer support may be required in stream crossings. Rate of movement averages 10 to 15 KM per hour. These vehicles can be used to great advantage in the coastal lowlands during the wet season where they can average 6 to 8 kilometers per hour. Their ability to swim across inundated portions of the land gives them a distinct advantage over non-swimming vehicles and foot troops. Since they are lighter than M48A3 tanks, use of many of the low capacity bridges is possible. Movement in the mountain regions is not feasible during the wet season.

2. Foot Movement. Foot movement during the wet season becomes more difficult in the coastal lowlands due to soft-soil of the inundated rice paddies. Rates of movement are about the same in the plateau region and in the lowlands averaging one to two KM per hour. Foot movement in the mountain
Air Movement. Helicopters provide the most effective means of movement in the mountainous regions of II CTZ, and enjoy their greatest advantage during the rainy season when the river valleys and low passes become inundated. In the wet season, helicopter operations are best conducted during the dissipation of early morning fog and low cloud cover. The coastal regions both have large, flat areas relatively free of vegetation, thus providing excellent landing sites. These are the same areas where tanks and APC's can operate most effectively year-round.

(6) The III Corps Tactical Zone. (Figure 15) The III CTZ covers 11,500 square miles, which amounts to about 18 percent of the total land area of RVN. It is divided into 11 provinces which are populated by about 4 million people or just over 25 percent of the total population of RVN. The majority of this population is concentrated in the Saigon area. Most of the land area within the zone consists of the Piedmont (Mekong Terrace) characterized by gently rolling hills and plains and dense vegetation. The Piedmont is bounded on the north by a small jungle area which is characterized by rugged, forested highlands. The eastern section is bounded by the southeast coastal lowlands which are characterized by sandy beaches, wide coastal lowlands, and rice fields. A small section of the flat-flooded Mekong Delta is located within the southern boundary of III CTZ.
The predominate types of ground surface in the Delta are marshes and rice paddies. The Rung Sat Special Zone, located southeast of Saigon, is a dense mangrove swamp, interlaced with rivers and streams and is inundated the year-round. Movement within the Rung Sat zone is generally restricted to boats. Some helicopter sites are available and rappelling techniques can be employed. Tidal currents generally restrict APC's to operating around the periphery. The main shipping channel to the Port of Saigon traverses the Rung Sat. Rainfall within III CTZ ranges from 70 to 120 inches. The wet season extends from May through November, but trafficability for tracked vehicles does not begin to deteriorate until late July or early August.

(a) Dry Season. (Figure 16)

1. Tank Movement. During the dry season 92% of the terrain becomes firm enough to support tank movement. The remaining terrain is 4% perennially inundated marshy areas, and 4% mountainous terrain that is covered with dense vegetation. The major obstacles which impede movement are the dense evergreen forests which restrict visibility and speed of movement. Movement can be made through the mountains during the dry season along the roads, trails, and stream valleys; but will require extensive engineer assistance if free movement is to be made across the mountains. Tanks can average 15 to 20 KM per hour in the open area of the Piedmont, the rate of movement is reduced in the jungle regions to 2 to 4 KM per hour.

2. M113 and M551 Movement. During the dry season the M113 and M551 are able to negotiate 93% of the terrain.
In the open areas of the Piedmont these vehicles can average between 15 and 25 KM per hour. The restrictions to movement in the evergreen forests are similar to those encountered by tanks, but due to their lighterweights and lower tractive efforts, these vehicles cannot maintain the same speed through vegetation as can the tank; their average rate is 2 to 3 KM per hour. Of the remaining terrain in the CTZ; 3% is mangrove swamps which, because of their soft soil and dense vegetation, can only be penetrated along the waterways; and 4% is mountainous terrain in which movement is restricted to roads, trails and stream valleys.

2. Foot Movement. The dense evergreen forests severely restrict foot movement. Troops must use the existing trails, or cut paths through the dense undergrowth, an extremely slow and laborious process. Rates seldom exceed .5 KM per hour. Tracked vehicles, especially tanks, can be used to good advantage to clear paths for foot movement through many of these areas. Foot movement across the open areas is generally good, but is considerably slower than the tracked vehicle movement; average rates are 2 to 3 KM per hour.

(b) Wet Season. (Figure 17)

1. Tank Movement. During the wet season the southern portion of the CTZ, consisting mainly of rice paddies, becomes too soft to support the medium tank and tank movement can be made only along roads or higher elevations. Movement through the forest and mountains is essentially the same as during the dry season with the exception that the stream valleys in the mountains flood. Movement in the open areas is reduced to an average rate of 8-15 KM per hour. Jungle rates are generally less than 3 KM per hour.

2. M113 and M551 Movement. Movement of the M113 and M551 is the same during the wet season as during the dry season with the exception that the waterways are frequently easier to cross during the wet season. The higher water level in effect serves to reduce the height of the banks. Rates of movement in the open areas are somewhat degraded by the wet ground but averages run from 10 to 15 KM per hour. Rates of movement in the jungle seldom exceed 2 KM per hour.

2. Foot Movement. Foot movement in the coastal lowlands is generally unrestricted, but becomes difficult during the wet season due to the soft-soil and large inundated areas. During the wet season, APC's can be used to advantage to assist the movement of foot troops. Average rates per hour are 1 to 2 KM in the open areas and .2 to .5 KM in the jungle.

(c) Air Movement. During the wet season, air operations will be hampered by low ceilings and fog in the morning hours. From late December through April weather conditions are ideal. The large number of existing sites make helicopter operations an effective means of movement in the CTZ. Due to the flat terrain in most of the zone, new sites can be constructed as required with relative ease. Many open areas also can be found within
The IV Corps Tactical Zone. (Figure 18) The IV CTZ covers 14,000 square miles or about 20 percent of the total land area of South Vietnam. It is divided into 15 provinces which are populated by approximately 5 million people, 1/3 of the total population of RVN. Wholly located within the Mekong Delta, it is characterized by an extensive, flat poorly drained plain that is severely dissected by a network of large and small rivers, streams and canals. Rice paddy is the predominate type of ground surface with marshes and swamps interspersed throughout. Mangrove swamps abound along the coasts and major streams. Rainfall in the Delta is not very heavy and is therefore not the primary cause of wet ground conditions. The state of the ground is affected primarily by flooding, either controlled for rice cultivation, or uncontrolled by the Mekong flood period. Flooding of the Mekong coincides with the Southwest Monsoon and reaches its peak during September-October. The U Minh Forest (Figure 18) is a dense mangrove swamp laced with canals, rivers and streams. Trees, vines, exposed roots and dense undergrowth are marks of mangrove swamps. Swamp depths, depending on tides and floods, vary from one meter of mud to one meter of mud covered by two meters of water. Tides cause river currents to change direction as the tide changes. Salt water is excluded by dams along the coast. Movement is lim-
Figure 19. Dry Season Going, IV Corps.

- **Key:**
  - GO, TK-APC
  - NO GO, TK-APC
  - NO GO, TANK

**Dry Season (Figure 19)**

1. **Tank Movement.** During the dry season, beginning in December and lasting through April, 60 percent of the terrain becomes firm enough to support tank movement. Movement is slow and difficult because of the numerous streams and canals which severely compartmentalize the rice fields. Average rates of 2 to 4 km per hour are possible. These waterways are unfordable because of their steep banks and soft-soil bottoms, but can be crossed by the use of armored vehicle launched bridges (AVLB).
or portable bridges. The high frequency of waterway crossings dictate that consideration should be given to a substantial increase in the number of AVLB’s if cross-country tank operations are to be conducted in the Delta. The numerous paddy dikes and small irrigation ditches are not considered to be significant obstacles, and only serve to reduce cross-country speed. Throughout the paddy land, cover and concealment are poor. Due to the slightly higher elevation of the roads, fields of fire and observation are excellent, and in many cases extend to the maximum effective range of the tank weapons. The VC uses the vast network of inland waterways as access routes throughout the Delta. Tank fire from the roads could deny him the use of some of these routes. Since the majority of the roads are of earth construction, and have limited capacity bridges, engineer assistance would be needed for road maintenance, and construction of increased capacity bridges and by-passes.

2. M113 APC and M551 Tank Movement. During the dry season, the M113 and M551 are able to negotiate 87 percent of the terrain year-round. The paddy dikes, which are generally 1 to 2 ft high, do not present a problem to movement during the dry season; but can, in conjunction with soft-soil, immobilize these vehicles during the wet season. They are easily overcome by the use of explosives to breach the dikes, by selecting avenues of movement which cross only the lower dikes, or by the use of push bars between vehicles. Speed or movement in the riceland is mainly restricted by the waterways. While these vehicles have the ability to swim, many of the steep-sided, soft-soiled banks do not provide sufficient traction to enable the vehicles to exit from the water. Exits are usually easier during the high water period when the water level, in effect, serves to reduce the height of the bank. Use of ground anchors, capstans, and other field expedients allows the M113 to exit under its own power. Movement only becomes restricted when dense vegetation in combination with soft-soil presents sufficient resistance to overcome the traction effort of the vehicle. M113 can move across inundated portions of the road networks and thus insure continuous security to otherwise relatively inaccessible areas. Average rate of movement varies from 4 to 6 kilometers per hour.

2. Foot Movement. Dry paddies and reduced water levels in the marsh areas expedite foot movement throughout the entire area, but the troops still experience difficulty in crossing the numerous water courses. Average rates of 1 to 2 kilometers per hour are seldom exceeded. Foot movement in the mangrove swamps is extremely difficult. Troops are able to move only about three kilometers a day, and frequently sink chest deep in the water and soft-soil. The high salt content of the water in the coastal mangrove swamps has an adverse effect on the human body, and foot troops must be relieved after 48 hours of operation in this terrain.
(b) Wet Season (Figure 20).

1. **Tank Movement.** During the wet season, the soil in the rice paddies becomes too soft to support tank movement and tanks are restricted to the use of roads during this season. Tanks could fulfill a role in keeping the road net open if desired. The roads are of earth construction, with limited bridge capacities and inundated portions, and would require continuous and extensive engineer support to allow travel.

2. **M113 and M551 Movement.** Movement of the M113 and M551 is the same during the wet season as during the dry season with the exception that the waterways are easier to cross during the wet season. The higher water level, in effect, serves to reduce the height of the bands. Rates of movement are about the same overall because of reduced traction averaging 4 to 6 KM per hour.

2. **Foot Movement.** Foot movement during the wet season is reduced to 93% due to water levels above six feet in the plain of the reeds area. Movement through the rest of the CTZ will be more difficult than during the dry season due to the soft-soil rice paddy floors, and the increased water levels in other areas. Rates of movement do not exceed one KM per hour.

(c) **Air Movement.** Helicopters can be effectively employed in the Delta year-round, day and night. Operations may be hampered during the rainy season by thunderstorms which usually occur between 1500 and 2000 hours. Early morning ground
fogs occur during the dry season but usually clear by 0900 hours. During the dry season the rice fields provide numerous landing sites.

(8) Summary of the Going in RVN. Going characteristics for tanks and APC's throughout the Republic of Vietnam (RVN) are summarized in Figure 21. Overall, tanks can move with organic support in 61 percent of RVN during the dry season and in 46 percent during the wet season. APC's can move in 65 percent of RVN year-round.

PERCENT GO—TRAFFICABILITY

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<th>APC</th>
<th>TANKS</th>
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Figure 21. Summary of the Going by CTZ.

SECTION II

DOCTRINE, TACTICS AND TECHNIQUES

1. GENERAL.

a. PURPOSE. Current U.S. doctrine concerning combat tactics and techniques employed by armor and mechanized infantry units is based principally on experience gained during World War II and the Korean War. Maintenance of effective doctrine demands continuous review of its application by units engaged in combat. The purpose of this section is to describe applications of current doctrine, tactics and techniques and variations in these applications being employed by U.S. Army mechanized infantry, tank, armored cavalry and air cavalry units presently conducting combat operations in RVN.

b. SCOPE.

(1) The rapidly accumulating RVN combat experience of several mechanized infantry battalions, tank battalions, and armored and air cavalry squadrons, coupled with observation of combat operations of these units by field data collectors of the Mechanized and Armor Combat Operations in Vietnam (MACOV) Study Group, constitutes the basis for the discussion which follows. The discussion presents variations in application of current doctrine and employment of tactics and techniques in conjunction with applications of current doctrine. A separate detailed discussion of tactics and techniques used in employing air cavalry has been prepared and will be distributed as a U.S. Army Combat Developments Command draft field manual.
A large number of combat actions adequately documented or personally observed by MACV Study Group members are available for reference. Included in this section are those actions which are most typical and which illustrate particularly those tactics and techniques being discussed.

Figure II-l. M48A3 Tanks and M113 Armor Personnel Carriers Cross a Clearing after Emerging from Jungle North of Saigon

c. THE NATURE OF AREA WARFARE.

(1) The warfare presently being conducted in RVN has been variously described as non-linear, multi-directional, unconventional, or area warfare. Through the remainder of this section it will be termed area warfare. Area warfare results when armed forces seeking to achieve control of the population of a country are unable to or do not desire to conduct military operations in the traditional sense, i.e. by the seizure of a succession of terrain objectives while maintaining a continuous front or line of demarcation between one's own forces and those of the enemy.

(2) U.S. forces' participation in the area war of RVN is characterized by widespread tactical offensive operations by units varying from platoon to multi-divisional size; the combat operations are logistically supported from semi-permanent unit base camps widely located through most regions of RVN; and the unit base camps, in turn, are further dependent on large-scale logistical installations established in several coastal locations in the vicinity of deep-water ports. U.S. tactical offensive operations have the general goal of locating and destroying the enemy armed forces as opposed to the seizure of terrain objectives; concurrently, U.S. forces must provide security to their own base camps and supporting logistical installations. All offensive and security operations must be undertaken within the broader goal of restoring RVN government control over the population so that nation building can progress throughout the RVN.

(3) The area type warfare, the elusive nature of the enemy, and insufficient friendly intelligence regarding the location and activities of the enemy require that units must expect contact with the enemy at any time and from any direction. Tactical units are constantly ready to deploy in any direction on short notice; supporting fires are provided by units located in relatively secure fire support bases spread to provide complete coverage of the area of operations and to provide immediate fire support in all directions.
Adequate security forces garrison the perimeters of fire support bases, base camps, and logistical installations; while reaction forces are maintained to exploit the opportunity to destroy the enemy wherever found. Because of the multi-directional nature of area warfare in RVN, U.S. forces are also required to secure ground lines of communication connecting logistical installations, base camps and tactical units in the field. At times, due to bad weather, untrafficable terrain, or enemy activity, tactical operations are partially or entirely supported by air lines of communication.

(4) Other characteristics of the area war in RVN are the broad distribution of friendly civilians throughout RVN and the inability on the part of friendly forces to adequately distinguish them from the enemy. Restraints on the employment of combat power are appropriate to avoid casualties among the civilian population. These restrictions are referred to as "rules of engagement."

(5) The character of the war in Vietnam varies significantly from region to region, reflecting the peculiarities of each of the four RVN Corps Tactical Zones (CTZ). In each CTZ, forces must be capable of fighting organized North Vietnamese Army and Viet Cong units, defeating the guerrilla, developing area stability, and securing lines of communications.

Figure II-2. Elements of Armor Task Force Conducting Road March West of PLEIKU.

d. DOCTRINE. Doctrine and tactics contained in appropriate field manuals are generally valid and applicable to mechanized infantry and armor combat operations in Vietnam. However, U.S. doctrine and training are primarily oriented toward a conventional tactical environment. Doctrine related specifically to the area war is incomplete. Examples of additional tactics and techniques which are employed in RVN and which can enrich our present doctrine are enumerated below; they will be discussed in greater detail in appropriate paragraphs of this section.

(1) The M113 armored personnel carrier is being
employed by U.S. armor and mechanized infantry units in a tank-like role; like their ARVN counterparts, U.S. crewmen often remain mounted and employ the MlL3 as an assault vehicle to close with and destroy the enemy.

(2) With the emergence of the MlL3 as a fighting vehicle, armor scout and mechanized units are engaging the enemy in mounted combat; current doctrine prescribes this form of combat only for tank units.

(3) A logical result of employing the MlL3 in a tank-like role is the cross attachment of mechanized infantry units with straight infantry units so that each can benefit from the particular capabilities characterizing the other.

(4) The employment of air cavalry has developed far beyond the limits of current doctrine.

(5) Armored cavalry units, particularly the squadrons of the armored cavalry regiment, are being increasingly employed in those roles previously assigned to armor and infantry combat maneuver battalions rather than being restricted to the traditional reconnaissance, security, and economy of force roles.

(6) The area war in RVN finds a reversal at times in the traditional functions of armor and infantry units; armor unit encounters with the enemy have often times resulted in the armor firepower fixing the enemy force, while infantry units maneuver by helicopter to a location from which they can attack the enemy in his position.

e. EMERGING TRENDS. Data and reports available to the MACV Study Group evaluation staff and observations made by MACV Study Group field data collectors reveal the following trends in application of existing doctrine:

(1) With some exceptions in the delta region, the enemy has consistently taken advantage of densely vegetated areas to avoid contact with armor and mechanized infantry at long ranges; the typical engagement of the enemy by all types of U.S. forces occurs at pointblank range in dense forest. The proximity of the forces upon contact restricts the effective employment of supporting artillery fires and air strikes directly onto the positions of the enemy in contact. The commander must develop the situation through the employment of fire and maneuver on the part of forces immediately available to him; the resulting attack should employ available supporting artillery fires and air strikes behind the immediate enemy positions to prevent his escape and to prevent his introduction of reinforcements.

(2) Effective night operations currently being conducted in RVN further restrict the freedom of movement of the enemy.

(3) Although large portions of RVN are trafficable for armor and mechanized infantry operations, the terrain generally slows the cross-country movement of armor vehicles; the local commander on the ground must constantly reappraise his plan of operation as it pertains to concepts of maneuver, speed of execution and flexibility.
The widely applied concept of dispersion in the defense does not prevail in RVN; the enemy's ability to infiltrate defensive positions dictates the opposite, and his shortcomings in antitank weapons and heavy artillery make tight consolidation within defensive perimeters an acceptable deviation from doctrine.

(5) The establishment of fire support bases within which to locate supporting artillery and mortar units is usually necessary to provide adequate coverage of an assigned area of operations. In some cases, this requires the assignment of other tactical units to provide security to the fire support bases.

(6) The command and control helicopter provides the ground commander with an additional means of control. Use of the command and control ship is in accordance with the principle that the commander position himself where he can best control the battle.

(7) There is a continuing requirement to develop and employ effective means for the coordination of the support available from Army gunships, tactical air, and artillery; only through extensive and imaginative pre-planning and constant attention to this coordination can a commander derive the maximum benefit of all available fire support.

(8) Rules of engagement necessary to preclude inflicting unwarranted casualties on the civilian population of RVN restrict the employment of both direct and indirect fires; reconnaissance by fire is generally prohibited to those units operating in areas not designated as free fire zones.

(9) Current intelligence doctrine is adequate. The best intelligence results from close liaison and coordination with local indigenous intelligence agencies.

f. CAPABILITIES OF ARMOR AND MECHANIZED INFANTRY UNITS.
The capabilities of armor and mechanized infantry units enumerated in appropriate field manuals remain valid and pertinent to combat operations in RVN.

2. COMBAT OPERATIONS - GENERAL
a. TYPES OF MISSIONS. Missions typical of U.S. combat operations in RVN are search and destroy, clear and secure, and security. These missions entail the conduct of offensive, defensive, reconnaissance, security, or economy of force operations. In RVN, units are frequently assigned missions in various combinations simultaneously, e.g., perform search and destroy operations in assigned area of operations and secure a given route from A to B; or, conduct clear and secure operations in assigned area of operation and provide convoy escort to elements passing along a designated route. These missions may be assigned to infantry, tank, mechanized infantry, and armored or air cavalry units.

(1) Search and Destroy. These operations are designed to locate enemy installations, destroy or evacuate supplies and equipment, and to destroy or capture VC forces. Less importance is attached to seizing and holding critical terrain than to finding and finishing the enemy armed forces and political infrastructure. Search and destroy operations should be planned and conducted so that disembarked
forces physically search zones within an area of operation. The
dismounted forces must be given the opportunity to cover the zones
thoroughly and the means to destroy or evacuate what they find.
Against VC base areas, operations aim at the ultimate domination of
the bases. Whenever possible, operations against VC forces are con­
ducted so that the enemy is attacked by a combination of maneuver­
ing and blocking elements, both supported by artillery and air fire
support. During a search and destroy operation, armor and mechanized
infantry units are initially engaged in area reconnaissance and in­
telligence missions; when contact with the enemy is made, they un­
dertake offensive operations as in any meeting engagement.

(2) Clear and Secure. These are offensive combat
operations aimed at driving VC forces out of a designated area and
keeping them out. U.S., RVN Army (ARVN), and Free World Military
Assistance Forces (FWMF) conduct clear and secure operations in
selected areas in accordance with theater plans. These operations
are generally initiated by search and destroy actions but differ
from pure search and destroy in that they are sustained and emphasis
is placed on seizing and holding key population and communication
centers.

(3) Security. These operations include convoy, route,
base, and area security. Convoy security operations can be accom­
plished by temporarily securing the route to be used or by accom­
panying the convoy with an appropriate mix of combat units; time
involved is limited to that required to complete the movement of
the convoy. By their nature, the others are generally longer in
duration and, like clear and secure operations, are normally con­
ducted in conjunction with some search and destroy actions. These
security operations are for the purpose of seizing and holding routes,
installations and facilities. In the immediate environs of their bases,
U.S. units are specifically charged with securing key military installa­
tions and routes. Security operations are normally conducted with min­
imum forces committed: if strongly attacked, security forces are
supported by quick reaction reserves. Highly mobile armor and mechan­
ized infantry units are particularly well suited for reaction force
missions.

(4) Revolutionary Development (RD). All missions
assigned to U.S. units directly contribute to the goal of nation­
building, the reestablishment of RVN government control over the RVN
population. In general, RD is conducted in phases: U.S., ARVN or
FWMF units conduct military operations within designated areas not
presently under RVN government control - typically, search and de­
stroy followed by clear and secure operations; ARVN units then
assume responsibility for securing the area and for establishing
necessary Regional and Popular Force units from the local population;
RVN civil government officials, working in conjunction with national
and local police, gradually assume control from the ARVN units; and,
finally, the ARVN units are released to conduct operations in other
areas. U.S. units conduct civic action operations in conjunction
with tactical operations in the form of the Medical Civic Action
Program (MEDCAP), needed engineer construction assistance, and dis­
tribution of food, soap, clothing, and other supplies. Although
these civic actions contribute to gaining the friendship and support of the population, they are normally of short duration and are characterized by short-range goals. Experience has shown that intelligence information may be gained from the local populace as a result of civic actions. U.S. units closely coordinate civic action efforts with district and province officials through the U.S. military and civilian advisors assigned to the area to avoid interference with long-range RD goals. In RVN I Corps Tactical Zone the U.S. Marines actively participate in the long-range RD efforts of RVN Regional and Popular Forces (RF/PF). In those areas in which RD is being conducted near Marine bases, squads from a U.S. Marine Combined Action Company (CAC) are assigned to live and work with RF/PF units to provide direct U.S. participation in RD operations.

b. MOUNTED COMBAT AND M113 ARMORED PERSONNEL CARRIER IN A TANK-LIKE ROLE. A salient feature of armor and mechanized infantry combat operations in RVN is the emergence of the M113 operating in the role normally attributed to the tank. Modifications made on unit vehicles to better equip them for this role vary from the addition of sandbags to provide the vehicle commander a degree of protection from shell fragments and small arms, to the installation of equipment kits to provide an armored turret for the commander and two added M-60 machineguns complete with armored shields and flexible mounts located to the right and left of the cargo hatch (resulting in the vehicle called the armored cavalry assault vehicle or ACAV). Present doctrine does not cover the use of the M113's as tanks but the following example illustrates their effectiveness in that role.

![Figure II-3. Armored Cavalry Assault Vehicle (ACAV).](image)

1. Vehicle Commander with .50 caliber machine gun.
2. Driver.
3. M60 Machineguns.
(1) Combat Examples.

(a) On 2 December 1966, a small resupply convoy consisting of two trucks, two tanks and three M113's was ambushed in the vicinity of SUOI CAT (See Figure II-4). The enemy force was estimated as two VC battalions with local guerrilla forces attached. As the VC forces opened fire, the convoy reacted violently in accordance with squadron SOP; the armored vehicles continued to move, escorting the trucks through the ambush position while pouring a heavy volume of accurate fire into the brush on both sides of the road. The tanks and the M113's then returned to the fight and again raked the area with 90mm canister, caliber .50 and 7.62mm machinegun fire and hand grenades. By this time, elements of three troops of the squadron, including the tank company, were moving to the site. Artillery and tactical aircraft provided support within ten minutes after being called, although the employment of neither had been preplanned. In this operation, the two tanks and three M113's were able to maintain the firefight until the arrival of reinforcements. Ninety-nine VC were killed (body count) and three were captured; American losses were one killed and 22 wounded.

(b) The other example concerns a company of mechanized infantry engaged in OPERATION CEDAR FALLS during January 1967. Two platoons, dismounted from their carriers and moved to destroy a VC basecamp previously uncovered and determined to be unoccupied. The VC had reoccupied the camp meanwhile, and they succeeded in pinning down both of the U.S. platoons with accurate automatic
Figure II-5. Enemy and Friendly Dispositions for 2 December 1966 Ambush. Vehicles of U.S. convoy traveling north were arranged in the order: lead M60A3 tank, two M113's (ACAV), two trucks, one M113 (ACAV); and the trail M48A3 tank. Road in this area has elephant grass on both sides for about 60 meters and secondary timber beyond.

Figure II-6. Friendly Dispositions Following Concentration of Armored Cavalry Squadron to Reduce 2 December 1966 Ambush. Initially, air strikes were conducted in area south of the road, and artillery fires were restricted to area north of the road. Subsequently, upon completion of air strikes, artillery fires were shifted to main enemy positions south of the road.
weapons and rifle fire. Men of the platoons who exposed themselves to return the fire were killed or wounded. The company commander was able to extricate his platoons from this situation only by committing his third platoon and his own command element mounted in armored personnel carriers. Two carriers of this relief force were disabled by enemy recoilless rifle fire, but the high volume of machine gun fire delivered from the armor protection of the moving carriers killed or drove off the VC force, freeing the company to continue on its mission.

(2) Doctrine. Current doctrine treats the armored personnel carrier as a means of transporting troops rather than as a fighting vehicle. Its stated primary function has been to provide infantry and mechanized infantry units the capability to:

(a) Maneuver with a high degree of cross-country mobility with light armor protection and multiple means of communications.

(b) Exploit the effects of mass-destruction weapons.

(c) Complement and enhance the inherent capabilities of tank elements, when employed in infantry-tank task forces.

(d) Provide a highly mobile exploitation force when suitably reinforced with appropriate combat, combat support and combat service support elements.

(e) Traverse inland waterways while mounted.

Employment of mechanized infantry as described in training literature is invariably tempered by the inhibiting assumption of a sophisticated enemy possessing a significant antitank capability. Doctrinal publications presently place great emphasis on dismounted action as the principal contribution and predominant role of mechanized infantry, the scout sections and rifle squads of the cavalry squadrons, and of straight infantry. Mounted combat is mentioned, but only superficially discussed; no specific mention is made of a mounted unit which remains mounted, i.e. fights from its carriers throughout the greater part of the operation.

(3) RVN Variations. Combat experience in RVN reflects a different situation. Although numerous AT mines and some recoilless weapons are encountered, no significant enemy antitank capability exists. The M113 is used as a fighting vehicle in a tank-like role, i.e. as a vehicle-mounted weapons system with armor protected firepower and excellent cross-country mobility. The crews (squads) dismount only when forced to by untrafficable terrain, the presence of a large number of AT mines or requirements to conduct a detailed search for tunnels and bunkers. Seldom are less than three men left on the M113 when a squad dismounts. M113's are also used to break trails through jungle and knock down trees in much the same manner as tanks. In addition, combat operations in RVN reveal many situations for which mounted combat is appropriate. Here the determinants are trafficability and availability of carriers and not the density of armor-defeating weapons. The armored personnel carrier is habitually used as a fighting vehicle and not just as a means of transportation within the cavalry squadrons and mechanized infantry.
battalions. During OPERATION SILVER LAKE, in January 1967, a mechanized infantry battalion successfully conducted purely mounted combat operations.

c. ORGANIZATION FOR COMBAT.

(1) General. To enhance the combat capabilities of assigned units, commanders in RVN cross-attach tank, infantry, mechanized infantry, and armored cavalry units in accordance with current doctrine; flexibility of task organization inherent to the MDAD division concept is fully exploited. The factors of METT (mission, enemy, terrain and weather, and troops available) remain the principal considerations used by commanders in RVN for determining how they will employ armor and mechanized units available to them. Restrictions on employment of firepower resulting from rules of engagement sometimes constitute an additional factor.

(2) Cross-attachment to Improve Mobility. Imaginative attachment of straight infantry units to armor or mechanized infantry units can provide an increased mobility to a dismounted unit. One U.S. tank battalion in RVN habitually uses the M113's of its scout platoon and surveillance section (sixteen M113's total) to mount an attached rifle company. During OPERATION SAM HOUSTON, in January 1967, this battalion initially used these carriers to mechanize an attached U.S. rifle company and later to transport an RVN Civil Irregular Defense Group company operating in coordination with the battalion. On both occasions in this search and destroy operation, company teams were able to range to more distant portions of the assigned area of operation and traverse larger areas as a result of their rapid movement through tangled undergrowth. Another technique was demonstrated during OPERATION TUCSON in February 1967; while the two lead companies of a mechanized infantry battalion proceeded to their assigned areas to commence the search and destroy mission, the third company was temporarily attached to a straight infantry battalion. By dismounting the attached company (except for drivers and vehicle commanders) at its bivouac area, the straight infantry battalion was able to use the carriers to deliver its companies to their starting points by making three shuttle trips; then the carriers were released to return to pick up their assigned squads and to rejoin their parent mechanized infantry battalion. Excellent preliminary coordination and a very professional execution of the plan accomplished the tactical deployment of both battalions smoothly and rapidly.

(3) Cross-attachment to Provide Armor-protected Firepower. Cross-attachment of straight infantry with mechanized infantry in order to exploit the capabilities of both is the logical extension of employing M113's in a tank-like role. Since the M113 is used as a fighting vehicle, it can be used in conjunction with foot troops as are tanks. There are areas which tanks cannot traverse but which can be negotiated by M113's; tank units may be desired but not available for cross-attachment with straight infantry; in these instances,
attachment of mechanized units constitutes an appropriate alternative.

4. Armored Cavalry Squadrons as Combat Maneuver Battalions. Armored cavalry squadrons are being increasingly employed in these roles previously assigned to tank and infantry combat maneuver battalions rather than restricted to the traditional reconnaissance, security and economy of force roles. This has evolved primarily due to the nature of the enemy and the concept of area warfare. There are no definitive battlefields in the traditional sense and with the propensity of the enemy to avoid contact by moving in small groups and massing only for short term offensive actions, the emphasis for employment of U.S. forces has shifted to destroying the enemy wherever and whenever he is located. The armored cavalry squadrons have proven to be responsive to this concept of aggressive offensive action in RVN because of their balanced combined arms structure and inherent capability for quick response and extended independent action. The extensive firepower and combat strength of the armored cavalry squadron have dictated its more effective use in the role of a well balanced maneuver battalion rather than in its traditional roles.

d. COMBAT SUPPORT.


(a) 4.2 inch Kortar Platoons. Tank and mechanized infantry battalions are constantly confronted with two basic problems in employing their organic 4.2 inch mortar platoons: the nature of the war in RVN requires the capability to quickly deliver fires in any direction; and the minimum range of the 4.2 inch mortars (840 meters) normally precludes their use in firing missions directly in front of the perimeter in which they are positioned. Imaginative employment of these platoons in RVN has partially resolved these problems.

1. Some platoons occupy firing positions in such a way that the tubes are laid in four different directions. This arrangement permits rapid response to requests for fire in any direction. The rate of fire possible with one tube is considered adequate for routine fire missions, and the capability of shifting additional tubes for increased fires is retained.

2. Artillery is habitually available to provide fires in support of mechanized infantry and tank battalion operations. For a battalion to achieve maximum fire volume for close-in defensive fires around unit positions remote from large base camps, it is desirable that 4.2 inch mortar fires as well as available artillery be employed. To achieve this when not positioned within range of an adjacent unit, battalions regularly establish two or more separate perimeters sufficiently far apart so that mortars located in one can fire defensive missions in support of the other; should the commander choose to locate the entire mortar platoon within only one of these perimeters, close defensive concentrations for that perimeter in which the mortars are located can be fired by the artillery.

(b) 4.2 inch Mortars of the Armored Cavalry Squadrons. Problems in employment of 4.2 inch mortars organic to the armored cavalry platoons are generally the same as those described above; in addition, the enemy situation is usually such that positioning of a
single undefended mortar sufficiently remote to provide close continuous support to its platoon is impractical. The platoon mortars are usually grouped at troop or squadron level and employed like those of a mortar platoon. Because of their habitual employment of mortars in battery, armored cavalry units have improvised a mortar fire-direction center. An interesting variation is demonstrated in one squadron's employment of all nine assigned mortars in prepared positions arranged in a triangle (Figure 11-7). In addition to providing fires quickly in all directions, this arrangement provides a wide variety of sheafs without computing individual data for each tube; proper selection of tubes to fire a given mission can provide coverage of an area, of a line approximately perpendicular to the line of fire, or of a line approximately parallel to the line of fire.

Figure 11-7. Nine mortars of an armored cavalry squadron grouped to provide defensive fires for the squadron base camp. Typical sheafs appear on the right.

(c) Antitank Platoon. The antitank platoon, equipped with 106mm recoilless rifles mounted on 1/4-ton trucks, is able to negotiate only roads and improved trails in virtually all areas of operation assigned to mechanized infantry battalions. Because of this lack of cross-country mobility, antitank platoons are not usually employed on missions other than route and base camp security.

(2) Artillery, Army Gunships, and Tactical Air Support.

(a) Artillery.

1. Fire Support Base Concept.

2. Current doctrine prescribes that indirect fire support be positioned so that it is responsive to the maneuver force. To accomplish this task in the area warfare environment of the infantry, supporting artillery must be capable of rapid delivery of fires in every direction. Fire support bases (protected artillery unit firing positions) are normally established within or adjacent to unit areas of operation where they can provide maximum fire support with minimum displacement.

E. Weapons are positioned within the defended perimeter of the fire support base so that they can provide immediate direct or indirect fires in any direction; their direct fires assist security elements in conducting defense of the fire support base from enemy attack. An artillery battalion of the airborne division advocates that battery positions be arranged in the form of a star. This positioning of guns is recommended because it provides a direct fire capability in all directions, depth to the position
in the event one gun is overrun, and an effective sheaf for area fire when the guns are laid parallel. Infantry elements protecting the position dig in around the perimeter forward of the guns.

Figure II-8. Battery Fire Base with Guns Positioned in "Star."

2. Security of Fire Support Bases. Fire support base security requirements are the responsibility of the supported force. Most unit SOP's prescribe that a company-sized unit will secure a battery fire support base. Since normal artillery practice in RVN is to assign one battery in direct support of each combat maneuver battalion, the requirement to secure fire bases would theoretically result in a reduction of available maneuver elements by one-third. However, by positioning reaction forces and headquarters elements with the artillery batteries in the fire support bases, by locating fire support bases within defended U.S. or AVN base camps, or by grouping two or more batteries in each fire support base, this apparent drain on maneuver resources may be partially alleviated. This security requirement is one of the main reasons why maneuver battalions require a fourth line company.

(b) Army Gunships. When available, Army gunships assigned a mission in support of a battalion or company enter that unit's command net upon arrival in the area; coordination required to identify areas or targets to be attacked and to determine location of friendly units is made on the command net. Normally, Army personnel (Bn CO, Arty Ln O, Co CO, Arty FO, or Plat Ldr) control gunship strikes from their positions on the ground.

(c) Tactical Air Support. Only in isolated instances do the Air Force forward air controllers (FAC) actually exercise their control from ground positions. Dense foliage usually prevents observation of friendly unit dispositions and targets to be attacked, and orientation and position location are difficult to determine from the ground once units leave the roads or operate beyond sight of villages and other precisely located terrain features. Supported units and FAC's prefer that airstrikes be controlled from light observation aircraft above the operation. FAC's operate from airstrips within or near assigned areas of operation; they normally are able to reach the target area prior to the arrival of jets or AI El Skyraiders from more remote bases.
1. TAC airstrikes can be requested by any company through command channels or through USAF communications personnel who are habitually attached to battalions for this purpose and who operate on the ground in the battalion CP locations; such USAF personnel bring with them the communications equipment necessary to obtain an airborne FAC and to request TAC aircraft.

2. The FAC has in his aircraft the equipment necessary to communicate directly with the battalion on the command net and with the TAC pilots on the TAC Air Control Net.

2. Commanders agree unanimously that tactical air support procedures in RVN are highly effective and responsive to the needs of their units.

(d) Coordination of Simultaneous Artillery and Tactical Air Support. The abundance of fire support available to maneuver units in RVN or the particular qualities of targets encountered sometimes results in the simultaneous employment of both artillery and tactical air. Since artillery cannot obtain clearance to fire through airspace being employed by aircraft conducting strikes in support of ground forces, the capability to use both depends upon effective coordination by the supported unit. The coordination usually is achieved by the designation of a readily identifiable terrain feature (river, trail, or road) as a fire coordination line (FCL); artillery fires are directed on targets on one side of the FCL (up to the FCL) while airstrikes are directed on those targets located on the other side of the FCL. It is also practical to coordinate consecutive rather than simultaneous employment by suspending artillery fires during the execution of airstrikes; it is evident, however, that gaps in the supporting fires occur as the artillery ceases fire and the aircraft are directed against targets, and again when the aircraft finish and the artillery is obtaining clearance to resume firing.

e. IMPROVEMENT IN NIGHT COMBAT CAPABILITY. New techniques which enhance armor and mechanized infantry units' capabilities to conduct offensive and defensive combat operations at night are related to new equipment presently available or recommended for issue. Both the infrared and the visible light capabilities of the Xenon searchlights mounted on tanks can be used extensively in the conduct of night operations. The program of installing these lights on all

Figure II-9. Xenon Searchlight Mounted on M60A3 Tank.
tanks in RVN continues and is heartily endorsed by commanders concerned. Image intensification devices are also effectively and enthusiastically used by all units possessing them; similarly trip flares are used and other commercially produced intrusion detectors are being procured for use in RVN. Infantry units include light intensification devices along with Claymore mines and other bulky defensive equipment in SOP "night kits" designed to be helilifted to those elements conducting dismounted operations as they assemble for the night in remote areas; mechanized infantry and armor units normally carry sufficient material on their tracked vehicles to preclude the need for "night kits". Because image intensification devices are comparatively new to the Army's inventory of night vision equipment, and because intrusion detectors are only now being recommended for procurement and issue, further discussion of both is appropriate.

(1) Image Intensification Devices. Image intensification devices are optical-electrical scopes which enable the operator to observe relatively well under conditions of near-darkness; since they emit no energy to illuminate the field of view, they are dependent on the presence of some faint light source such as starlight or weak moonlight. They are effective on all but the darkest night. They are presently available in three models: the small hand held or individual weapon sight (Starlight Scope), the crew-served weapon night vision sight, and the medium range night observation device. The Viet Cong has amply demonstrated his ability to move undetected under the cover of darkness. Maximum use of image intensification devices should fully exploit our technical advantage over the enemy in this area.

(a) Ambush Operations. Effective use of these scopes enables friendly troops to conduct frequent and persistent night operations. Image intensification devices are particularly useful for ambush operations. They are used to observe and monitor the area surrounding the ambush site and provide early warning of the enemy's approach. The increased night observation range provided by these scopes lengthens the time the ambush party has for making final preparations once the enemy has been detected moving toward the killing zone. These scopes provide the ambush party the capability of selection and discrimination of targets under cover of darkness.

(b) Night Patrols. On night reconnaissance patrols, image intensification devices contribute to the security of the patrol by providing an added surveillance capability during movement. In addition, they are used to assist in maintaining direction and control by enabling personnel with compasses to pick out landmarks at a much greater distance for use as reference points. This reduces the number of halts required for patrols to verify their positions. They are used to check danger areas such as clearings, stream beds and other possible ambush sites. They are also used to assist patrols in passing through friendly forces.

(c) Perimeter Security. The employment of image
intensification devices reduces the number of personnel required for perimeter sentry duty. Use of these scopes enhances the effectiveness of the firepower of the defensive positions. The operator can call for illumination of the target area, fire tracers into the target area, or make reference to range cards. The devices can also be used to select targets for supporting weapons and can aid in the adjustment of these fires.

(2) Intrusion Detectors. The AN/PHS-1 Intrusion Detector Set (a seismometer) has been adopted as standard equipment by the U.S. Army in Vietnam. This set can detect enemy intrusion for a limited distance in all directions from each of four detectors. Employment in dense or saturated soils provides increased range; in fact, best results have been obtained in damp moist ground.

(a) The intrusion detector, used in conjunction with light intensification devices, can remove the doubt as to whether there is an actual enemy probing the perimeter of an area. Detectors wired in parallel and connected to control boxes through a main control cable can provide good surveillance for an area to be defended when employed on the most likely avenues of enemy approach. The control set can be monitored from a remote location by using field wire. Employment of this device reduces the number of troops required to secure either a base camp or tactical unit perimeter.

(b) In addition to providing a warning of enemy presence, intrusion devices can be deployed to pinpoint the direction and location of of the enemy. Accurate placement of the seismometers will allow the defending unit to illuminate the precise area being intruded.

(c) The intrusion detector is well suited for employment by units performing ambush missions. The detectors are placed along the ambush trail; and, as the enemy comes within detection range, the control set operator alerts the ambush patrol. This intrusion device is best used in conjunction with the Xenon searchlight, crew served weapons night vision sight, or range cards to bring firepower to bear on the enemy.

Figure 11-10. Schematic Diagram Showing One Arrangement of Intrusion Detectors. Note that four detectors can be monitored from one location and that direction of enemy approach can be determined by the operator.
(3) Radar. Night surveillance techniques dependent on radar equipment have demonstrated only limited success in the RVN environment. The best results have been obtained by employing radar in conjunction with image intensification devices.

f. FIRE AND MANEUVER — FIRE AND MOVEMENT. A fundamental of offensive tactics is to maintain contact, once gained. Only by maintaining contact can a unit develop the situation rapidly and forcefully. In the area war environment of RVN, the enemy's doctrine has taught him to avoid situations in which his position is fixed. This, together with the dense vegetation found in much of RVN, results in numerous meeting engagements at point-blank range. In these meeting engagements, commanders use the forces immediately available to fix the enemy and to maneuver to develop the situation. Because of the proximity of forces, it is seldom possible to employ supporting artillery fires and air strikes on the enemy forces directly in contact unless the unit withdraws; withdrawal, even for a short distance, results in breaking contact thus permitting the enemy to escape. To avoid this, supporting fires are placed on the rear and flanks of the enemy to prevent his withdrawal. Once his location and strength are reasonably clear, the decision to attack or to withdraw to permit supporting fires to be brought in can be taken.

g. REVERSAL OF ROLES BETWEEN ARMOR AND INFANTRY.

(1) Present doctrine states: "In the envelopment the attacking force avoids the enemy's main defensive strength by going around it on the ground or over it by air to seize an objective in his rear and disrupt his communications and support, cut his escape routes, and subject him to destruction in position . . . Although favored as the enveloping force, armor units may participate in the envelopment by executing a supporting attack." Because of the difficulty of fixing the enemy in place in area warfare, surprise and speed are essential in the employment of the enveloping force. Air-mobile infantry has been found more effective than armor in this role in RVN. Conversely, armor has been found to be highly capable of executing the supporting attack because of its sustainability under enemy fire and its ability to thrust through jungle and rice paddies at a greater speed than that of infantry in many areas. This trend is all to the good but should be recognized as a reversal of the favored employment of infantry and armor as contained in current doctrine.

(2) Current doctrine also states: "Infantry normally dismount to lead an attack through heavily wooded terrain." Because of the enemy's use of antipersonnel mines and booby traps and his propensity for conducting ambushes in jungle areas, this technique is frequently reversed. Tanks lead attacks through the jungle whenever possible, breaking trails, destroying antipersonnel mines and disrupting enemy defenses. The mechanized infantry follows to complete the destruction of the enemy, and they then make a dismounted sweep of the area to obtain intelligence information and to destroy enemy installations. This again is a noteworthy reversal of roles normally attributed to infantry and armor.
h. COMMAND AND CONTROL.

(1) Land Navigation. Upon leaving established roads and trails in RVN, mounted units often become disoriented. Despite adequate maps and the demonstrated ability of leaders to use them, the absence of identifiable landmarks and the heavy vegetation (conditions encountered often in RVN areas in which U.S. units presently operate) preclude accurate determination of ground locations. Control of unit movement from a helicopter resolves the problem of orientation. In the event helicopters are not available, units have relied on observation of artillery fire, usually smoke, air burst or illuminating rounds, requested on coordinates estimated to be nearby. A limited number of vehicular compasses mounted on M113's have been effectively employed by some units to maintain direction. Dismounted troops working in conjunction with mounted units can guide the vehicles along designated azimuths by using their compasses and dismounted radio sets as they follow along trails made by the vehicles. In this technique the odometer of the vehicle and the compass of the dismounted element constitute sufficient equipment to employ dead reckoning in reaching prescribed positions. In using this technique, the user must convert miles registered by the odometer to kilometers in order to relate distances traveled to distances on his map. (Odometers which register distance traveled in kilometers have been recommended.) To determine one's location most quickly, however, the helicopter is indispensable.

(2) Position of Commander. The preceding remarks concerning the indispensability of the helicopter for rapid navigation of armor and mechanized infantry units through dense vegetation are not intended to recommend that any commander habitually control his unit from an airborne CP. Aircraft do provide the commander with a capability to move rapidly throughout the area of operations to influence critical actions by his personal presence; but, in many instances, his influence, inspiration and control of his troops requires his physical presence on the ground.

(a) During combat operations in WW II and Korea, the commander usually oriented his attack or defense on key terrain. Because the enemy usually considered the same terrain "key", the decisive point of the battle, both in time and space, was often predictable.