

Maj. Gen. Ernest N. Harmon's Notes on Combat  
Experience During the Tunisian and African  
Campaigns

NOTES ON COMBAT EXPERIENCE  
DURING THE TUNISIAN AND AFRICAN CAMPAIGNS

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1. Most Essential Requirements for Combat:

In general, our tactical doctrines are sound, the only requirement being to place greater emphasis on some points and less emphasis on others. We need not bow to any other country as to our military preparation. The Germans are superior to us mainly in their thoroughness and greater discipline. I feel that we are inclined to attempt to cram too much into the common soldier. Instead of teaching him a few fundamental things thoroughly, we attempt to cover too wide a field, with the result that when he arrives in the combat zone, he really is not thoroughly competent in anything and has to learn some of the most essential lessons in the combat zone. I consider the following five points to be the most essential requirements for combat:

a. Thorough and Complete Basic Training for the Individual and for Small Units.

This includes not only the elementary basic training of the soldier in all subjects such as discipline, camouflage, dispersion, sanitation, use of cover, etc., but above all, the use of his weapons — perfection in marksmanship and crew drill. Tank battles are usually won by the tanker who gets the first shot in. Speed and accuracy are essential. Crew handled weapons must be worked at night and under heavy fire with speed, accuracy and without second thought — automatically.

The leadership and responsibility of the small unit leaders as the squad and platoon, the perfection of the training of these units must be given greater emphasis and less emphasis placed on the operation of the larger units such as battalion, regiment, and division. The division will succeed only as the platoon succeeds.

b. Development of the Offensive Spirit and Eagerness to Close with the Enemy.

In the consideration of this subject we are up against one of the imponderables. We never know just how green troops and officers will act. We may be assured, however, that the first time in battle all officers and men will be considering their own safety, more or less, rather than the duty which they have to perform. Confidence in battle comes with experience, with leadership, with comrades and weapons. It is absolutely necessary to inculcate a disciplined fighting spirit with a realization that a price must be paid for success and the willingness on the part of the individual officer and soldier to sacrifice himself to gain the objective. Men must be taught that every shell and bomb is not necessarily directed at them personally, that they all have a good chance to survive regardless of the intensity of hostile fire, and that whether or not they survive; someone has to pay a price if success is to be gained. We must build up the dignity, resourcefulness and responsibility of the noncommissioned officer and junior officer in preparation for his duties on the battlefield.

If possible, green troops should be put into a relatively easy fight the first time. Some troops who are forced to enter a severe battle for the first time, and suffer heavy losses, do not seem to recover from it for a long time or until practically all of the original men have left the unit. A man becomes a good soldier only when he put his duty above his personal safety. This is something that can't be taught. On the other hand, strange as it may seem there comes a time when men become battle weary, and then it is better to have fresh, vigorous men than to have tired, experienced soldiers. This time comes earlier with some men than with others depending upon the man's character, but it eventually comes with all of them and must be recognized and watched. If a man has taken part in many battles and has seen his original squad and platoon mates killed or wounded down to the point where only he and one or two others are left, he gets a mental complex that it is just a question of time until they will get him, and he begins to think about himself again. At this stage a fresh soldier full of enthusiasm, but with less experience, is much more valuable.

### c. Development of Leadership. \*

Men will follow a good leader practically anywhere and under any conditions of battle. Therefore, the placing in position of leadership of the right men is the most important safeguard for success in battle that a commander can have. Leadership is a natural gift. Some men have it to a very high degree, and others do not have it at all. We must be ruthless in weeding out and changing officers and men around so that the leaders are in the positions of leadership, and the others, regardless of their personal qualifications, are put elsewhere. Up to the time of battle itself, we are inclined to stress administration, paper work, and tactical knowledge above the flare for leadership. In this we are wrong. Wherever possible before battle we must select the natural leaders, and where they are weak in administration or in tactical knowledge, take pains to develop them. We must place the other officers, regardless of how high their qualifications are, on staff jobs or in positions where they are not in contact with the men.

After the first battle, the premium on leadership will be placed higher by all division commanders than it ever was before. In addition to selecting the leaders we must also provide the "second and third stringers" as we say in football. I consider this the most important duty of a division commander, and where time is available, the division commander should not hesitate to investigate as far down as the platoon commanders to see, by personal contact, that the man has the qualifications to lead his platoon and inspire their confidence and the willingness to close with the enemy.

In my last battle I lost two regimental commanders, nine battalion commanders, and forty-three company commanders in the space of twenty days, which illustrates the need for second and third string replacements to step promptly into the job and carry on. A well trained and coordinated division and any unit, for that matter, works on the same principle as a championship football team. Each man must know his job, there must be perfect teamwork, and there must be good substitutes to replace the injured men without weakening the team. There must be no favoritism, and selection must be ruthless. Don't forget that as goes the platoon, so goes the division.

d. Develop Teamwork and Coordinate with All Weapons and Arms of Service.

Some of the more important points under this heading are the coordination of infantry weapons with the artillery. There is a great tendency to let the artillery do the job. The infantry mortar and assault guns are closer to the front and subjected to heavy fire, and they often suffer heavy casualties. For this reason there is a tendency to have them remain silent so as not to draw fire, and let the artillery carry the burden of close in fires as well as the more distant fires. This, of course, is wrong as the infantry weapons are designed to bring close and accurate fire on areas that are difficult to reach by the artillery and on targets that are difficult to describe for the artillery. The effect of the artillery fire is thus minimized and not placed on targets where it should be and which cannot be reached by the shorter range infantry weapons. The massing of all fires on given areas or targets is most important.

The successful defense of the Anzio Beachhead can probably be attributed more to the successful application of massed artillery fires than to any other cause. This was not true in the early stages of the beachhead but was a development as time went on. The sudden concentration of a terrific volume of fire on a target usually insures a complete annihilation of the enemy at that point or the complete neutralization of his effort and is far superior to nibbling away by one battery or one battalion. The fire of all weapons within range should be adjusted so that all can be brought to bear with a maximum volume of fire. We welcomed news of an enemy counterattack forming, for under the system of massed fires the enemy was given a terrific punishment.

The coordination of artillery and infantry includes, above all else, the location of forward observers up with front line companies and platoons and dual means of communication. We learned not to depend on radio entirely, but wherever the situation permitted and wire was available in the theater, to provide the artillery observers with both radio and wire communications. Many times the radio has been put out of action and the wire cut, but with dual communications there still was maintained the vital communications so essential.

The coordinated teamwork between tanks and infantry is very poorly understood and executed except in armored divisions. It is surprising how little division and higher commanders understand the proper teamwork between the tanks and the infantry. Training in this vital teamwork has not been properly stressed in the States. We will not win this war with the tank alone, but we will not win the war without the tank. The enemy uses his tanks with his infantry, and unless our infantry has tanks fighting alongside, they are sure to be ruined by the enemy tanks. I have seen two enemy tanks practically annihilate a regiment of American infantry in twenty minutes. I have seen my own individual tanks mow down from two hundred to three hundred of the enemy in a few minutes time. Our battle trained infantry knows this, but the teamwork between the tanks and the infantry has been sadly neglected. First of all, there must be communication between the tank platoons and the infantry platoons and companies in order that the tank may be directed to the enemy which is holding up the advance, or that the tank may be informed by the infantry of antitank guns or tank traps which will delay or destroy the tank.

Prior to the breakout at the Anzio Beachhead, our G.H.Q. tank battalion were put under my command for training for the operation, with the result that for the first time infantry and tanks acted together as a coordinated team which resulted in a minimum of losses for the infantry and a mutual regard and admiration between the infantry and the tanks such as had never existed before. There must be developed a high degree of cooperation between the tanks, tank destroyers, and artillery.

Throughout the African and Italian campaigns the German Panther and Tiger tanks were superior in armament and gunpower to our tanks. It was, therefore necessary to have tank destroyers right up front with the tanks with their heavier three inch gun. This was the only gun outside of heavy artillery that could handle the Panther and Tiger tanks. Had our tanks been equipped with a more powerful gun, there would have been no need for tank destroyers. The tank destroyer simply had the gunpower that the tank lacked. Therefore, in the attack, the tank and the tank destroyer must go together with the infantry following close behind to take advantage of the ground gained.

In the defense, tanks and tank destroyers must be scattered over the front so as to handle the hostile tanks as they attack our positions. Forward observers from the artillery must ride with the forward line of tanks, and communication must be set up so as to bring the mass of the artillery fire on objectives with speed and accuracy. In general, ordinary artillery fire is not a great menace to the tank, for unless the tank is hit by heavy calibre artillery, it will not be seriously damaged. However, massed artillery fires on tanks has proven to be successful as a great volume of fire usually results in setting some of the hostile tanks on fire.

It should be borne in mind that a small, well drilled, and coordinated team can be counted upon to accomplish more than a larger but less coordinated team. That goes for battles as well as sports. Always take time to coordinate an attack. Don't allow yourself to be hurried. Allow time for your orders to get down to the lower units. Get all your men set. It will pay. Most attacks that fail, fail because they were not well set, and all the means at the disposal of the commander were not put into action.

e. Physical Fitness.

This point is well understood by the American Army and is one of our best training points. However, we must prepare ourselves according to the job that we are expected to do and according to our age. The spectacle of a division commander running across country to get himself in shape is absurd as he will not be required to withstand physical hardship that requires that kind of endurance. He may very well injure himself by such exercise. A division commander must prepare himself to go without sleep, to withstand the worry and responsibility of battle, to be calm and fit.

On the other hand, the infantry soldier must be given long practice marches with full pack, up hill and down so that he can withstand the fatigue of carrying a burden, so that he can withstand exposure in cold and wet weather without getting sick, so that he can go several days without hot food.

The tankier must be able to stand the heat of his tank, the foul atmosphere of his tank, the jolting and body bruises.

The artilleryman must be able to fire all day and all night with little sleep and be strong enough to chuck the ammunition in. The ordinary setting-up exercises are not sufficient. We must prepare our men with hard, gruelling work.

## 2. Speed on the Battlefield.

All movement on the battlefield is relatively slow and deliberate. We get a false picture of speed in maneuvers because we don't play supply accurately, we don't have casualties, and we don't take the time for reconnaissance which is required on the battlefield. In maneuvers we have been guilty of rewarding officers and men for grandstand moves such as would be impossible to make on the battlefield and which give a false impression of what can be accomplished. Speed can be made by rapid decisions, by going rapidly from one reconnoitered place to another, by thinking ahead and being prepared with the solution for emergency when it arises, and, above all, by forethought as to how to handle the contingencies of battle when they come up.

A division commander must always be thinking in terms of what is going to happen from six to twelve hours ahead of the present. Steady boring in all day long is what wins the battle. Many tanks were lost in the early days under the false training idea of boiling down the road into contact where the enemy anti-tank guns were sitting in a trap and picked our tanks off like ducks. Hundreds of infantry men have been sacrificed by throwing them into an attack without coordinating fires, without preparation, without reconnoitering the ground. The mark of a well trained and superior outfit is the deliberate and assured way it goes into battle, checking on every detail, seeing that everything is set, making provisions for what will probably happen in the immediate future. The mark of a Boy Scout division is its great industry, its hurry and bluster and lack of appreciation for and attention to intimate details that go to make up coordination and assured effort.

An objective in battle is usually won in the first few hours after the attack begins, or it is not going to be won at all with the initial combination set up. If the attack jumps off at daylight and is bogged down by ten o'clock in the morning, the division commander must realize that a change in his plan must be made. To put such a change into effect and thoroughly loosen up the battlefield will require at least six to eight hours, so the new assault can't take place much earlier than five or six o'clock in the evening. I have seen many attempts to hurry this schedule with the result of failure in the new attempt. The new change may involve a greater concentration of artillery on a certain front, the throwing in of greater force against a front heretofore weakly attacked, etc. If in doubt as to whether you can attack at a certain hour, it is always best to add another hour to insure a better understanding among the lower units of your plan. Always brief your commanders as far down the line and as thoroughly as time will permit.

The American soldier is fundamentally intelligent and does a lot of thinking for himself. If he understands the general plan and what you are trying to do, he will very often contribute very greatly to the success of that plan. He will surprise you when left to his own devices and in the absence of detailed orders later in the course of battle. We are generally afraid that the private will know too much, and if captured, will talk too much about the plan and thus give it away. I believe this to be over emphasized. If I had time, I would tell all privates practically everything about the plans and would get much better results thereby.

One of the greatest contributing factors to the successful breakthrough in the Anzio Beachhead was the great amount of detailed planning and the great amount of briefing that was given to the noncommissioned officers and privates in the tank and infantry units. Remember that you never know when the second, third, and fourth stringers will step into the shoes of the battalion, company, and platoon commanders. If your attack is to continue smoothly and according to plan, these men must know what it is all about, or your attack is bogged down for hours. I consider this one of the most important things to stress in training and on the battlefield. I also feel that as a result of our school teachings it is one of the most overlooked practical ideas.

Give time for briefing. Add plenty of safety factors on all logistics to take care of the imponderables such as heavy shelling, destruction of trucks and bridges enroute, losing the way, etc. It is better to wait for the battle to begin than to be late arriving in the attack positions.

### 3. Coordination of Tanks, Infantry and Artillery.

The tank-infantry-artillery team is little understood outside the armored divisions, and this lack of understanding is a distinct failure of training in the States. It must be corrected at once.

The tank is designed to bear the brunt of battle, and its crew must be trained to accept the dangers and be willing to lead in the attack wherever the ground permits. On the other hand, the infantry must not sit back on the hill and watch the show. Failure of the tanks to take the lead and bear the brunt of battle has brought disparaging remarks upon them by the infantry. Failure of the infantry to come up and take over the ground taken by the tanks has caused the tanks to curse the infantry. Failure of the artillery to mass its fires and help pave the way by neutralizing the antitank guns and smothering hostile artillery has lost many a fight.

In a later paragraph I will discuss the difference between G.H.Q. tank battalions and the tank battalions of the armored divisions and what I consider to be a remedy to change a rather bad situation.

The following is a training directive issued in preparation for the breakthrough at the Anzio Beachhead relative to infantry, tank, and artillery cooperation. All assault battalions of infantry and assault battalions of tanks were trained along these lines, and the operation was very successful. It is believed the principles are sound and should be adopted as a basis for all infantry and tank cooperation.

"There are two general types of action for tanks and infantry: one in which, due to the character of the terrain, obstacles or concentrations of anti-tank guns in which the infantry makes the principal attack closely supported by tanks; and the other in which, due to the favorable terrain for tanks and where the enemy's principal defensive lines has been broken, tanks go through to exploit the success and the action is characterized by the tanks making the main effort with the infantry in close support to assist them over obstacles encountered, to take over the ground gained, and to outpost the tanks for the night. The tank was developed for the primary purpose of taking the brunt of the battle from the infantry, to go through areas protected by antipersonnel mines and wire, and small arms and machine gun fire. Every weapon available to the enemy is a potential killer of the infantry soldier; only a few weapons are deadly to the tank. The principal enemies of the tank are unfavorable ground for maneuver, antitank mines, antitank guns and artillery. The armor of the tank furnishes reasonably good protection against artillery fire unless artillery of large caliber makes direct hits on the tank itself or very close to it, and even in these cases the tank soldier rarely is injured although his tank may be temporarily put out of action. The casualty rate among tankers is relatively low averaging approximately  $1\frac{1}{4}$  men per tank crew, but of these casualties only a small proportion are fatal, a great majority of the casualties being slight, and the men are returned to duty in a relatively short period of time. The foregoing facts are borne out by statistics kept over a long period of time and obtained from actual tank encounters. It is, therefore, reasonable and right to expect the tanker to move boldly out to the front lead the infantry, and take the brunt of the battle wherever the terrain permits.

"Artillery observers must be up forward with the tanks and with the advanced lines of the infantry to promptly and accurately bring fire on enemy installations holding up the advance. To much cannot be stressed on the importance of the coordination between the artillery, tank and infantrymen. Upon the skill of the artillery and the concentrations of its fires depends the success of the advance, particularly of the tank when held up temporarily by antitank fire.

"Tankers should move forward by bounds covering each other by fire from tanks in hull down positions in the rear. The advance of tanks may be rapid in spots and slow at other times as the tankers must study the ground carefully from one point of advance to another. They must move rapidly from the rear position to the selected position forward. Above all, they should have the attitude and spirit to lead the attack, to continue the advance whether slow or rapid, and continually bore in to arrive at the final objectives. No other thought should be in their minds, otherwise they are not good tankers and the expenditure of money and effort for the manufacture of tanks is wasted.

"The coordination and communication between the infantry and tanks are paramount. There must be established radio means of communication so that the infantry company commander can direct the the tank on to the hostile dispositions which are holding them up and giving them casualties.



"Normally in an attack in which the infantry has the main tasks and is closely supported by tanks, the tanks should be attached directly to the infantry battalions. In the case where the tanks make the main effort the infantry is attached to the task commander or moves under orders of the task force. In the preparation for an attack the tank commander will advise the infantry commander after careful study of the ground, maps and airplane photographs of the best manner in which to employ the tanks. The infantry commander should accept this advice and build his attack around the tank wherever possible. Communications must be thoroughly worked out. This requires in the most cases special radio equipment able to communicate with the tanks to be in the hands of the infantry.

"Special provisions must be made prior to the attack for assisting the tanks over wadis and other obstacles. This must not be left to chance. If there are sufficient engineers available, a detachment of engineers may be set up for this purpose; if not available, then a part of the pioneer section of the infantry reconnaissance platoons, or sections of the reconnaissance companies of the armored regiments, might be used. If neither of the foregoing is available, then the infantry must act aside one or two squads of men equipped with picks and shovels for this purpose. In an emergency any soldiers nearby the tank that is having difficulty must be prepared to come to the assistance of the tank to help it over the obstacle, as the value of the tank in continuing the advance is well worth the use of riflemen for this purpose.

"Tanks should habitually lead the infantry in the attack. ✓ Infantry scouts may ride on the backs of the tanks as far forward as hostile machine gun and rifle fire will permit, and then continue in close proximity to the tanks to point out to them targets and assist them in getting over bad terrain. The infantry assault should follow the tanks closely as possible so as to promptly take advantage of the ground gained by the tanks. The distance behind the tanks will depend principally on the rule that the infantry should not follow the tanks so close as to come under the artillery and other fires which are directed on the line of tanks. As previously stated, this distance varies with the terrain, and with the type and amount of hostile fire being received. If the terrain has been studied carefully prior to the attack, the tanks will know that they can reach a certain line and then will have to halt and take turret defiladed positions while the infantry passes through them and establishes a bridgehead on the further side of the obstacle. Artillery, infantry mortars, and the fire from the tanks should cover the establishment of the bridgehead which normally should include smoke to screen the advance and the bridging operations. As soon as the bridgehead is established or the smoke screen is laid, the tanks should advance promptly and cross the obstacle. Members of each tank crew should promptly reconnoiter on foot for the best crossing site and man detailed to assist the tanks should begin the preparation of the crossings. The tanks should cross immediately after the crossing is prepared and be covered by the fire of tanks remaining in position; all the tanks should get across as soon as possible. Prior to crossing the obstacle, the tanker should study the terrain and have well in mind where he is to go upon reaching the other side. After crossing the obstacle, the tanker goes through the infantry line and leads the advance until he is again stopped by unfavorable terrain, minefields or concentrations of antitank weapons. In case of antitank weapons, artillery fire will be called to neutralize them, in case of minefields, reconnaissance will be made to find a passage through or special means brought up to blow a passage through so that the tank can continue the advance; in case of another obstacle the infantry will have to come up and establish another bridgehead.

"Special provisions should be made by commanders to have infantry or other troops close behind the tanks to take over prisoners. On many occasions in the past, large numbers have surrendered to the tankers and have escaped later for lack of an escort to take them to the rear. While the attack is in progress tanks should not be taken from the battlefield to escort prisoners to the rear unless it is an emergency. Where large groups of prisoners are taken, the tanker may have to escort them until friendly forces can take them over. Planning should provide means to take this burden off the tanker and permit him to continue in the assault.

"The antitank gun is a tremendous asset in the advance of the tanks and is an absolute necessity where the hostile tanks are superior in numbers or in armor and armament to our own tanks. It, therefore, will be the practice to attach tank destroyer units to the assault tank units. The tank destroyer units will follow the tanks closely from one hull down position to another so as to be able to cover the advance of the tanks with direct fire. The closest cooperation and means of communication between the tanks and the tank destroyers is essential. When the infantry is attacking without tanks but with tank destroyers, the same principles apply for the use of the tank destroyers with the infantry.

"It is a fixed rule and a point of honor that neither our tanks or tank destroyers will permit their infantry to be overrun by hostile tanks, no matter what it costs to themselves.

"Upon reaching the objective the tanker and tank destroyer must remain on the objective until the position is secured and the danger from counterattack by either infantry or tanks, or a combination of both, has been eliminated. Thereafter certain tanks and tank destroyers may be required to remain on the objective or close thereto while the others may proceed on another mission or go into reserve to refuel and refit.

"Provisions must be made in the employment of both tanks and tank destroyers for replacing the armored elements in the assault when they have to go to the rear to replenish their ammunition or gas without the loss of tanks and tank destroyer support. This is highly important. Reserve platoons of tanks and tank destroyer elements must be prepared to move to the front promptly to make the replacement. The relief must be made so that there will be continuity of armored support.

"The above principles will be taught to all tankers, tank destroyer personnel and all infantry. Much has been said about what armor will do in battle. Let us make good our promise of support. Let the infantry follow us closely and assist us to get forward and thereby have established between the armor, artillery and infantry that mutual respect and comradeship on the battlefield which is so essential to the success of our cause."

#### 4. Observe the Principles of Mass.

Many attacks during the African and particularly in the Italian campaigns failed because the principle of mass was not observed. This permitted the enemy

to move his reserves freely from one part of the battlefield to another. A good rule to follow is: "If you think you can take an objective with a tooth pick, use a baseball bat to make sure." The massing of artillery fires in particular was a development of the Anzio Beachhead which had an outstanding effect on the successful defense.

Beware of attempting to deceive the enemy by sneaking up on them and not employing all your fire power. It is better to come in with all guns blazing. One of the greatest losses sustained in my own division was in an action where the high command decided to do away with the artillery preparation in the false hope that the enemy would be surprised. The enemy not only were not surprised but were waiting for the attack with the result that the infantry suffered severe losses which would not have occurred had the artillery laid down a curtain of fire to protect them.

We sailed into Safi harbor in North Africa quietly, waiting for the French to fire the first shot, whereas how much better it would have been if we could have come in with all guns blazing to neutralize the shore batteries and installations that were waiting for us and which had been accurately located.

Throughout the African and Italian campaigns there was a continued demand to split the armored division and attach part of its troops to another force. The armored division, like any other division had been developed as a team, and the full success of its power can only be reaped when it acts as a unit and has all of its strength available for use.

#### 5. Air Support.

There was very little close support by air for ground troops in either the African or Italian campaigns. In the African campaign the air was mainly used on strategical missions and on missions for the good of the force as a whole. This was partially due, at least initially, to the lack of strength in the air at that time. There is no attempt here to belittle or minimize the wonderful work of the air in assisting the campaign as a whole, the destruction of the enemy's lines of communication, supply, etc. However, the close teamwork between the ground and the air was lacking. Tactical teamwork between the air and the ground, particularly with an armored division, has great possibilities. The air must receive special training in order to give this essential close cooperation.

In the first place, the air will require intensive training in locating itself on the ground and in picking up landmarks and coordinates. Our forces were repeatedly strafed by our own air by failure of our airmen to recognize our own vehicles and to know where they were at the time. Fortunately, the losses sustained were relatively light from this cause, but it created a distinct feeling among the ground forces that our air could not be trusted to work closely with us and in a desire for the air to work on more distant targets giving a wider margin of territory between the enemy to be worked on and our own advanced elements.

The 1st Armored Division, toward the latter part of the Italian campaign, carried out an experiment with a fighter-bomber group in an effort to develop closer cooperation and to obtain close in air support. The work was carried out with a great deal of enthusiasm by both the air and the armored division and great progress was made. The principal difficulty was in communications and in accurately describing to the air the targets to be worked on. Cub planes were painted yellow on their top wing surfaces and hovered over the hostile targets. They then described the targets to the incoming fighter-bombers. This worked out in a highly satisfactory manner after a little experimentation, but the main difficulty with this system will be that after the enemy has control or partial control of the air, the Cub plane will not be able to live in the air long enough to describe the target.

The greatest single aid to more effective use of armored formations, particularly in pursuit and where they are moving fast beyond close artillery support, would be the development of close air support by reconnaissance, strafing, and bombing. Failure of this air support presents the weakest link in our tactical team today. Let no one think that this close support can be quickly worked out or that because a system has been developed with one division that the same system can be employed with another division without first going through an intensive training period with both the air and ground people involved. It can be done, and it has been done, and the results are tremendously effective. Although the Air Service has been apparently reluctant to go into this work in the past, we find that the air people who are engaged in it and who have worked and overcome the difficulties of communications with the ground people are most enthusiastic about the results obtained. This cooperation requires special communication equipment, special crews to be set up, and intensive training in map reading, orientation, knowledge of ground vehicles and weapons, and their principles of operation.

#### 6. The Fallacy of Attaching Tanks, Tank Destroyers, and Antiaircraft Battalions to Division.

Our present system is to attach G.H.Q. tank battalions, tank destroyer battalions, and antiaircraft battalions to divisions. This has not proven satisfactory, principally for the following reasons:

First, the team play absolutely essential between these elements and the infantry and artillery of the divisions to which attached is not developed to the high degree necessary for successful action. One battalion serves with a division for a while and then is transferred to another division, sometimes in a short period of time, and they do not have the opportunity to work out team play. Second, those small separate battalions are often commanded indifferently, and no one looks after them to see that they have good leadership; whereas, if they were permanently a part of a division, the weakness in leadership would be apparent, and the division commander would take necessary action. Third, they are like orphans in the storm. No one looks after them. They suffer in personnel and maintenance requirements and are shifted around here and there from one corps to another or from one division to another with no one having a personal interest in them except the battalion commander himself. The above are very highly practical considerations although theoretically their needs are not so apparent.

Panzer Grenadier units of the German Army all contain organic tank elements. As long as the tank is so important on the battlefield, our infantry divisions should have organic tank battalions with them. The antiaircraft batteries normally with divisions are equipped with automatic weapons and are usually split up to protect the division artillery and the movement of infantry in trucks and also some of the installations of the division such as headquarters and supply establishments. These units should also work constantly with the same division although the requirement is less important since they have a mere passive defensive role than is true of the tank destroyer and tank battalions.

#### 7. The Tank Division vs. G. H. Q. Tank Battalions.

The quality of the G.H.Q. tank battalion in training for battle, aggressiveness, and general all-around efficiency was far below the standard of the tank battalion in the armored division. There was a continual demand from infantry divisions to get tank units from the armored divisions attached to them for attacks that were the normal objectives for G.H.Q. tank battalions. The reason given in all cases was that the tank units of the armored divisions were so much better trained and has a better fighting spirit and morale than the G.H.Q. tank battalions. Unfortunately, this attitude was generally correct, and the G.H.Q. tank battalions, with notable exceptions, did not do the work that should be expected of them. However, there were reasons for this which have been touched upon in the preceding paragraph.

In the armored divisions, the tank battalions were trained with the infantry and artillery of the division as a coordinated team. They had the benefit of a division commander to look after their leadership, personnel requirements, supply and maintenance problems. These items were lacking in the G.H.Q. tank battalions which were left on their own in practically all of the above items.

Several times during the campaigns officers from the 1st Armored Division were sent over to take command of G.H.Q. tank battalions and replace their commanders. The effect of this leadership was instantly apparent. Prior to the breakout in the Anzio Beachhead all of the separate tank battalions in the beachhead were put under the command of the 1st Armored Division for training, supply maintenance, and administration. This directive was enthusiastically received by the G.H.Q. tank battalions who realized they now had someone who understood their problems and would help them get what they needed to function.

The above discussion brings up the question of whether there should be G.H.Q. tank battalions or armored divisions or both and how they should operate. There should be both. There should be armored divisions with a powerful tank component for breakthroughs, for exploitation, for pursuit, etc. There should also be tank elements as component parts of all infantry divisions. I believe the solution to the problem is the armored division and the tank battalion as a component part of the infantry division. Let us not operate as we did prior to this war, with the infantry developing tanks in one direction and the cavalry in another and with a development of jealousy and incompetency in all directions.

The British and Germans both employ a heavy tank as the accompanying tank for infantry. Many arguments can be brought in on both sides, but after all is said, the main thing in a tank is gunpower and maneuverability. By maneuverability I do not mean speed on roads. I mean ability to negotiate terrain and get over roads and bridges which is just as essential to an infantry accompanying tank as to any other tank. If the above plan is adhered to it will be seen that the same type of tank is required whether it closely supports the infantry in taking limited objectives or whether it is part of an armored division which is predominantly strong in tanks to smash through defensive lines or to sweep around the flanks and rear of hostile positions.

#### 8. Tank vs. Tank Destroyer and Antitank Gun.

The antitank gun is a necessity on the battlefield for the infantry. It should be a towed weapon reasonably easy to manhandle, with a high muzzle velocity.

There is no need for tank destroyers. I believe the whole organization and development of the tank destroyer will be considered a great mistake of the war. In the first place, the doctrine originally promulgated, of the tank destroyer seeking out and pursuing the tank was a fallacy which caused the destruction of many lives and much equipment before it was corrected. The tank destroyer M-10, now in use, has proven of great benefit simply because it contained a 3 inch gun that was the best gun for coping with the Tiger and Panther German tanks. Had this gun or a more powerful gun been installed in a tank, there would have been no need for the tank destroyer.

The 37 TD mounted on a 3/4 ton chassis and a 75 gun mounted on a half track as tank destroyer weapons were absurd and could not possibly take the place even of the Grant tank with a 75 gun. The most effective use for tank destroyers was found to be to split them up into platoons and attach them to tank companies and tank battalions to furnish the extra gunpower required when the superior German tank was met on the battlefield. The German, up to now, has had superiority in tanks and tank gunpower in his Tiger and Panther tanks with their high velocity 88 and 76 calibre guns. Our 3 inch gun in the tank destroyer and our heavy artillery were the only antidotes although our M-4 medium tank was a much superior tank except for its gun and armor.

The Germans have self-propelled guns on the same principle as our self-propelled artillery in the armored divisions except that they went to higher calibres than the 105. They used these guns as roving guns on the battlefield and as such they were highly successful, but no more so than our own self-propelled guns except as to the weight of the artillery piece involved. The foreign armies have always been ahead of us in the development of high velocity pieces of ordnance, and for the last two years our troops have been continually outgunned by German pieces of ordnance. When the day comes that we equip our tanks with a high velocity and heavy calibre gun, there will be no need for tank destroyers as such, and they should be eliminated along with their overhead, etc. The artillery of the Army should develop both self-propelled and towed equipment as both have their use on the battlefield, and both have proven their worth beyond discussion.

## 9. Replacements and Replacement Training.

The replacement situation was not very satisfactory in the African and Italian campaigns. During the African campaign the 2d Armored Division was used in large part to furnish replacements to keep the 1st Armored Division in battle. Although some 19,000 highly trained armored force replacements arrived in Africa, these men were used to create new service units and were lost for their original purpose.

After the Mount Portia fight in Italy, the 6th Infantry of the 1st Armored Division lost heavily and had to fill its ranks with truck drivers, tank destroyer and tank personnel due to lack of infantry replacements.

In general, the replacements are not suited by training to take over their duties in combat. Unfortunately, the replacements received often had to go into the fight immediately and had no opportunity to be trained in their combat duties. Replacements of both officers and men came to the theater with higher rank than they were able to hold due to lack of experience and training in the unit to which sent. As a result, many of the officer replacements could not be used and had to be carried as surplus. This blocked the promotion of deserving men. A great many of the enlisted replacements had to be reduced in grade as they were incapable of holding down the job to which they had been promoted. Many of the enlisted men asked to be reduced after they themselves realized that they were incompetent. There would have been a far more efficient system if enlisted replacements were generally confined to basic privates and the officers were Second Lieutenants, thereby allowing the unit to promote its deserving and experienced men to fill the higher vacancies. It would then have been possible to fill in at the bottom with fresh men from the States. There would be exceptions to this rule as occasionally high ranking officers became casualties, and no suitable replacements were available in the unit. However, in most cases there were suitable men to fill their places within the unit, and if not within the unit itself, officers from adjacent divisions could be found to transfer over and become promoted thereby. These men had the battle experience necessary to carry on in an efficient manner while the battle was still in progress.

A general impression was gained that replacements from the States were not given sufficient intensive combat training but instead were trained generally to fill various specialists' ratings and that their training covered a broad field rather than having the fundamentals for combat stressed. There was small call for clerks and administrative personnel as this type did not suffer the heavy casualties. On the other hand, there was a great demand for the private soldier and the junior officer to fill the depleted ranks of the front line combat platoons and companies.

As a constructive criticism I believe less time should be given to the training in current events and all of the various items that have to be included on the man's service records as having been accomplished such as seeing a certain course of movies or listening to a certain course of lectures or having been psychoanalyzed. More time could then be spent on the fundamental drill and training to fit the man for combat work in the front line.

As soon as replacements arrived they were immediately given intensive training in these fundamental combat duties which were so evidently lacking. However, as stated above, it was the unfortunate rule rather than the exception that the men arrived and were, within twenty-four hours, put into the battle line. They had to learn in the hardest way without having been given sufficient opportunity for training. This situation was particularly true during a long sustained drive where it was essential that the units be kept up to strength in order to continue the attack.

#### 10. Infantry.

The infantry in this war, as in all other wars, has the heaviest casualties. However, their casualties would have been less had they been more soundly trained in the fundamentals and to operate more closely and efficiently with tanks and artillery. I believe it to be a fallacy to call the infantry "the queen of battles" because on the modern battlefield there is no king or queen, nor is any branch of service more important than another. They all have equal importance if the team is worked up properly.

Our infantry soldier was given the lowest classification as to intelligence, which is a mistake as it takes an intelligent man to be a good infantry soldier. The principal points which need to be stressed in infantry training are the fundamentals such as perfection of crew drill, the use of their weapons, and the fundamental formations to make maximum use of cover, terrain, and dispersion as they advance under fire.

Relative to tank-infantry cooperation, if the assault is on a definite single objective, the infantry should be in position to attack before the tanks arrive whenever practicable. Oftentime the infantry in position can observe elements in the situation which were not known or considered in the planning for the attack.

Assault guns were used as infantry direct fire support weapons on several occasions where the tanks had by-passed enemy strong points. The enemy infantry at these strong points engaged our infantry but were soon dispersed by direct fire assault gun support.

A good football team uses about eight to ten plays during a season, these plays are fully developed, and every man thoroughly understands them. He is drilled for hours in the fundamentals. A mediocre football team often has thirty to forty plays none of which are successful as no play is fully understood nor are the men thoroughly drilled day after day in the fundamentals. Good infantry is the same as a good football team and must concentrate on a few formations and drill constantly to perfect themselves. The following are some constructive criticisms that have been made during the training of the 6th Infantry prior to combat and are well worth considering in our preliminary battle training in the States:

"There was a considerable lack of dispersion which is a common fault and must be continually worked upon in order to overcome this natural human instinct to herd. This fault was particularly noticeable when passing over bad ground or



through woods on the part of the assault elements and was a common fault in the approach of the reserve elements under all types of terrain. We must remember that the assault elements are the ones that get in close in rifle and machine gun fire to the maximum, and the reserve elements are the targets for the mortars and the artillery fire. Our artillery continually attempts to separate the reserves and the supply of ammunitions, etc., from reaching the front line elements by destructive fires placed upon them. Usually the front line elements are in such close contact that neither the hostile or friendly artillery can fire on them. We must not be careless in the approach of reserves. They must come up with the greatest dispersion possible with effective control. They must use all cover available in the approach march or they will be pinned down by artillery and mortar fire and if not destroyed will be unable to support their front line elements when needed.

"There was a general lack of maneuver to overcome machine gun and other obstacles holding up the advance. The general tendency was to stop and call for artillery fire on every occasion when stopped by machine guns. It must be realized that artillery may not be able to properly reach the target or may be having priority calls on other missions such that it cannot fire on the target desired. The infantry must be alert to take advantage of the ground and while covering the hostile machine guns by their own fire, maneuver flanking forces to overcome the obstacles from the flank or rear.

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"There was a general tendency on the part of the infantry to depend too much on the artillery and not employ the many excellent close in weapons under their own control such as machine guns, mortars, and assault guns. The artillery has the range necessary to stop the forward movement of hostile reserves and the power to destroy hostile tanks and antitank guns. These targets cannot be efficiently taken under fire by the smaller weapons available to the infantry. On the other hand, the infantry weapons when properly used can handle many of the obstacles that are holding them up on the front fringe of the attack at close range. Every effort must be made by battalion and company commanders to get all of their means into action.

"In capturing ground from the German it is axiomatic that he will immediately counterattack with whatever he has at his disposal. This counterattack may be anything from a few men on up. Our troops upon arriving on a captured objective are more or less disorganized, and do not promptly organize themselves to meet the inevitable counterattack. This reorganization must be done on each platoon, company and battalion front at once. The reorganization includes the digging in by personnel, the proper sighting of machine guns and other weapons, and the prompt registration by the mortars and artillery on the likely avenues of approach by the counterattacking forces. The men of the 6th Infantry remember well that every objective they took in the "mouse trap" during Tunisian campaign was invariably followed by the counterattack. To the credit of the Regiment and also to the prompt action of the Division artillery in support, these counterattacks were with one or two exceptions promptly beaten back. Let us not forget this valuable experience and not fail to impress our new men with action required. Remember that we are having a considerable daily turnover of officers and men due to casualties, and these new people must be continually worked upon to thoroughly learn the

lessons which the older people can teach them and which have been learned the hard way with so much cost in lives and blood.

"Flank protection is paramount. In some cases during attacks the flank protection did not go out far enough. The mission of the flank protecting groups is to prevent surprise and to provide delay until elements from the main body can arrive and repel the threat. This means that the flank detachments have got to go out far enough on the flanks where they can see the approach of the enemy and to terrain that they can hold until help arrives." (1st Armored Division Training Directive).

Training must be continuous as units engaged in battle have an immense turnover. This point will be brought home more clearly when it is realized for example that in the past two years the 1st Armored Division alone has had approximately 34,000 battle and nonbattle casualties although its original strength was approximately 13,000. This illustrates the immense turnover and change in personnel. A division that is on the firing line is always more or less a new division, and after a heavy campaign its battle efficiency is probably not as good as a division in the States with all of its original trained men present, except from the standpoint of battle experience in the surviving members of the combat division.

## 11. Tanks

The war has proven the soundness of the principles taught by the Armored Force, and although many people were skeptical about the use of tanks, the tank has already proven itself a necessity and a bulwark on the battlefield, and in days to come its importance will be increased with better operating terrain available.

Unfortunately, in the Italian campaign the terrain and climate were such as to restrict the use of tanks tremendously, but even in that campaign it was the tank that made the breakthrough out of the Anzio Beachhead. It was the tank that assisted the advance of the infantry and the advance to join the southern force with the beachhead forces. Again it was the tank that bore the brunt of the push from Rome to the Arno River. The tank, however, is not an instrument alone. It must be closely supported by infantry and artillery. The tank was designed to take the brunt of battle from the infantry. Our tankers can be trained with the offensive spirit to lead the infantry in the attack. If the tank does not do this, it has not justified its existence. It's a well known statistical fact that although losses may be heavy in tanks, the losses to the personnel of tanks is relatively light, averaging about one and a fraction man per crew, and of these losses only a small part are fatal. Our tankers have learned to be alert, to observe carefully the foreground, and to go from one defiladed position to another with speed and assurance. Tankers need not be afraid of artillery fire and develop confidence in passing through heavy concentrations of artillery after they receive negligible losses therefrom.

Tanks can operate in much rougher country than was formerly thought possible. Field Marshal von Kesselring, the German Commander in Italy, paid a great tribute to our tanks when he stated that American tanks went through country thought impossible for tank operation and which had not, therefore, been properly

defended against them. He also stated that our tank-infantry-artillery teamwork in breaking out of the beachhead was a flawless example of attention to every detail.

The greatest single attribute of a tanker is to shoot accurately and with speed. The next is the spirit to continually bore in; however, with skill and with his eyes wide open to observe every possible point where the enemy could be concealed. All suspicious points should be shot at, and although the tanker may not see any enemy, the spraying of the ground in front with machine gun fire and the sending of a round of 75 ammunition into every suspicious bush, outhouse, haystack, or other point of natural cover upsets the defenders who do not know whether they have been located or not but who consider that they have been since fire is coming in their direction.

The tanks can make a path through hostile wire and antipersonal mine fields through which the infantry can pass without casualty. The infantry, on the other hand, can spot antitank guns and concealed enemy tanks and thus greatly assist the tanker.

In the pursuit north of Rome it was practice to carry infantry on the backs of the tanks, and when the tanks came to turns in the mountain roads, the infantry would dismount and reconnoiter around the turn to discover the presence of antitank guns or hostile tanks. Many tanks and guns were thus discovered, saving our own tanks from ambush and permitting a concerted plan of attack to remove the resistance and allow the column to proceed.

Our light tank was used to great advantage in moving with the infantry forward line to assist them in mopping hostile resistance which had been passed over by the heavier leading tanks.

The maneuverability of our tanks can be greatly enhanced by wider tracks. Increased maneuverability of tanks across country at the expense of speed is highly desirable, and above all, our tanks should carry the highest velocity and heaviest gun that can be carried consistent with other considerations, such as weight and power. Armor should be sacrificed for firepower and maneuverability on every occasion. Tanks must be withdrawn from the line after two or three days of continuous fighting but can be put into battle again after a short rest of twenty-four to forty-eight hours.

The tank crew fights all day and spends a large part of the night on maintenance and supply of gasoline and ammunition. Consequently, they get little rest. The service of the crew in the tank is most fatiguing due to the foul air, heavy jolting, and hammering.

A high explosive shell is the best type of artillery fire to be used in front of tanks. This type of artillery fire enables the tank commander to keep his head out of the turret, thereby giving the tank about fifty percent more efficiency than it would have if the tank were completely buttoned up. Our tankers in the Armored Division insist on the tank commander keeping his head out of the turret and won't serve under a commander who hasn't the courage to do this. However, the Germans know this, and we lost quite a few tank commanders by sniping fire. Time

fire by the artillery can be placed directly on top of the tank formation when the tanks are buttoned up but has the disadvantage that the tank is blind and is only about twenty-five percent efficient.

Artillery fire can be placed within fifty yards of the tanks without any undue damage. This requires careful adjustment of fire by the artillery and perfect coordination and teamwork.

The three great enemies of the tank are terrain, which restricts their maneuverability, the antitank gun, which can be concealed and destroy the tank at close range, and the mine, which can disable the tank temporarily. The ordinary mine usually blows the track which can be replaced very quickly. However, it must be remembered that a tank once it hits a mine will never operate with the same mechanical efficiency again because, although the track and bogies may be replaced, certain stresses and strains are set up in the driving mechanism due to the sudden stopping of the machinery. A tank that has hit a mine never operates at more than seventy-five to eighty percent of its original mechanical efficiency.

## 12. Mines.

The extensive use of mines, both antitank and antipersonnel, by the German is one of the greatest menaces of the present war. No area, either forward or back, is safe from the mine. The most effective enemy mining was the sporadic mining of long stretches of road, road shoulders, craters, and areas upon withdrawal. Heavily mined fords strewn with metal fragments to render detectors useless were also effective delays. In general, the enemy's mine technique and mine equipment were superior to our own.

During the later phases of the African campaign and throughout the Italian campaign the Germans employed a box mine made of wood and having practically no metal which made it almost impossible to detect with a mine detector. Also, there was introduced the shoe mine which was a small wooden box hidden in the grass or under the leaves and used as an antipersonnel mine.

Late in the Italian campaign a new type of antipersonnel mine appeared made entirely of plastic except for the detonating device. The Germans strewed these freely along the ditches and roadways. The German positions around the Anzio Beachhead were thoroughly covered with mine fields. They presented a great problem to the passage of tanks, a problem which was not solved. A large proportion of the heavy losses of tanks in the breakthrough at Anzio were caused by going through these mine fields. The antitank mine has no sure antidote except the slow, painful process of picking up the mines by detectors or by charging through the mine fields at great loss to vehicles.

The "snake" was successfully used in the breakthrough at Anzio and has possibilities where the mine field can be located ahead of time and where conditions are favorable for approaching with a tank to push the "snake" through the field. Several lanes were blown through mine fields with a great demoralizing effect on the enemy. However, the danger with the "snake" is its susceptibility to being set off by artillery and causing heavy casualties by our own troops in the immediate vicinity.

There was also developed a primer cord which was shot out of an infantry mortar and when detonated, cleared a path about 20 inches wide through the grass exploding the antipersonnel mines.

Tanks are impervious to the antipersonnel mine and can go through wire entanglements, which are usually strung with antipersonnel mines, clearing a way for the infantry. However, the solution to the problem of locating mines and mine fields is yet to be found.

Intensive mine training must be given to every officer and man, regardless of his duties. This should include detection, disarming, where mines are mostly likely to be found, etc. Our own mines proved to be a great menace. Many local operations were conducted during the siege of the beachhead such as raids on enemy strong points, etc., and in almost every case we had as much damage done by our own mines as we did by hostile mines. The sectors were occupied by different divisions, each one putting in more mines, and a careful record was not kept, as it should have been, as to location of the mines installed. Troops frequently place mines in front of their positions at night as a protection and go off forgetting to raise them or mark them properly. The result is heavy casualties to other troops which pass over the same ground later. Much more drastic discipline and training in the handling of mines and the use of mines by our own people has got to be employed.

### 13. Miscellaneous.

One of the most important items of equipment is the armored bulldozer. It played an important part in the pursuit of the Germans in Italy. Without it we couldn't have advanced as all bridges and culverts were blown, and houses were often blown into the streets. A greater proportion of armored bulldozers should be set up.

In the early days of the war we dissipated a great many 50 calibre machine guns and also 30 calibre machine guns by placing them on peeps, trucks, and vehicles for anti-aircraft defense. This has been partially rectified but we still are wasting too many machine guns for this purpose. It is absolutely unnecessary to install machine guns on peeps and individual passenger vehicles. 30 calibre machine guns are practically useless against air, and it is a grave question whether men will remain in their vehicles and fire any type of machine gun against a low flying hostile airplane.

The 37 millimeter gun is another weapon that has been built in large quantities and which has no practical use except in small quantities in the infantry to operate against machine gun nests.

In pursuit in rough country, column commanders must be well forward. Where only the first few leading tanks are engaged, a column commander should have his tank not more than six vehicles from the front, and the infantry commander should be right with him.

The Cub airplane has proven to be one of the greatest assets for artillery fire and, contrary to expectation, has been able to survive on the battlefield in spite of hostile air.

For liaison communications between infantry-tank-tank destroyer teams it is essential that a sufficient number of radio sets SCR-300 be available to permit distribution down to and including infantry companies, tank platoons, and tank destroyer gun sections.

All artillery should receive training in direct fire over the sights in addition to their normal indirect fire training. All tanks and tank destroyers should receive indirect fire training for use as artillery in addition to their normal direct fire training and should be equipped with the necessary sighting apparatus for indirect fire.

During a pursuit the use of reconnaissance elements, as the leading element in a force, merely because contact has been lost locally, is not justified in most circumstances. Where the nature of the expected next resistance can be in any way deduced - and it usually can - appropriate composition of the column should be made ahead of time to overcome it; usually time is saved in the long run if medium tanks lead. If demolitions, only lightly defended, are to be expected, light tanks in front work well. Putting a reconnaissance element in front is advisable only when it can be used deployed; in a situation wherein nothing more serious than undefended demolitions are expected or where a route reconnaissance appropriate to armored reconnaissance is expected to be the first operational problem to be met. In pursuit situations, liaison missions are so frequent that there is ample work for available reconnaissance without seeking opportunities for its employment otherwise. In a pursuit the three most habitual and most profitable uses of the armored reconnaissance platoon have been:

- a. Contact patrols to contact flank units.
- b. Flank observation posts.
- c. Reconnaissance of alternate routes parallel to axis of advance.

Motorcycles again proved their worth in the last operation. Because of the ability of the cyclist to get through heavy traffic quickly, the carrying of written communications was greatly expedited. Because of the single axis of communication available to the battalion throughout the operation, traffic was always congested, and during one phase, it took a motorcycle fifteen minutes to deliver an important message over a route that took a "peep" one hour and twenty minutes to travel.

Recent actions involving much combat reconnaissance have revealed the necessity for the following modifications in the Armored Car M-8:

- a. Added protection on the floor to protect the crew from mines; designing the floor to permit heavy sandbagging would be of some value.
- b. Better protection for the radiator. A regimental reconnaissance company had twelve (12) cars knocked out of action due to shell fragments through the radiators during a period of less than one month.
- c. Add a .30 Cal MG bow-gun to be operated by the assistant driver.

The hatches for the driver and assistant driver on light tanks should be redesigned to permit unrestricted movement of the gun when hatches are open. On many occasions the gun is fired when it is not advisable for the tank to button up.

In operations in mountainous or otherwise difficult terrain, the M-4 tank dozer proved to be the most valuable vehicle in the entire force. It is capable of working under artillery fire and the speed with which these vehicles were able to repair obstacles was not approached by any other method. They were kept well forward in the column at all times as they could rapidly reach the head of the column when needed.

Present camouflage nets are very inflammable. Many have been set on fire by shells or bombs causing great vehicular damage and loss. The garnishing material is not dyed fast and must be replaced in a few months.

When TDs are firing in artillery roles, it is highly desirable to have a large size fire extinguisher placed in a hole to rear of M-10.

Sights, both direct and panoramic, should be equipped with night lighting devices. Makeshift lighting devices are not satisfactory. In direct fire at night, hits simply will not be obtained without such devices.

At the present time all members of the armored car crew in reconnaissance elements are armed with the carbine. It has been found that an automatic weapon similar to the Thompson Sub-Machine Gun must be the arm of one of the occupants of the turret of the armored car particularly when operating in close areas infested with enemy infantry. The enemy will watch the traverse of the turret and move towards the armored car when the turret guns are not pointed directly at them. This automatic weapon provides necessarily rapid close in fire against these individuals who attempt to disable the vehicle by approaching from blind spots.

The "Bazooka" would be more effective if the ammunition was more sensitive to detonation. Its effect on houses and fortified strong points would be doubled if it did not take such a direct hard blow against a very solid substance to detonate it.

The packing of mortar ammunition should be improved. A wood chest, 3 rds per chest, with a handle for carrying, is suggested.

Combined infantry-tank training cannot be stressed too much. Recent intensive training of the armor of this division with infantry elements of another division proved to be of great value. This was shown by closer cooperation, better understanding of capabilities and limitations of troops, weapons of other units. However, it is felt that while close support of tanks, medium or light, is desirable, it was found not to be always practicable. In most instances it has moved forward faster than foot troops can advance. By lingering and waiting for infantry to mop up, the tanks expose themselves unduly, and if the tanks continue on, enemy infantry will rise up and a regular infantry battle ensues, thereby breaking up the tank-infantry team play. This situation was remedied by using medium tanks for the assault punch and attaching light tanks to the infantry to

assist in mopping up operations. It is believed that semi-permanent tank-infantry teams, trained together and used together whenever possible in combat will alone insure the accomplishment of a tough mission.

More training must be devoted to the meaning and requirements of one's combat missions. This will require commanders of all echelons to be more careful and concise in the assignment of the mission, to question the subordinate commander carefully to avoid all possible misunderstanding of the mission. It will also require the subordinate commander to devote more care to the complete understanding of his mission. Then, he must be allowed full independence of action within the scope of his mission. With the full knowledge of what is to be required of him, the subordinate will be able to conduct himself and his command more intelligently, with the long term requirement in view. It will also render the constant repetition of orders, which are dependent on perfect radio communication (often lacking), much less necessary.

More emphasis must be placed on training of combat and reconnaissance patrols. Use of prescribed routes, reports of where, when and what, and the necessity for the accomplishment of the mission cannot be too strongly impressed on combat personnel.

As this has been a discussion mainly on training, details as to recommendations on changes in equipment and tables of organization, particularly as pertain to an Armored Division, will be covered separately.

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