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Tactics and Mechanization
By Colonel J. F. C. Fuller, British Army

In war the object of a commander is to accomplish victory at the smallest possible cost and loss, and the means whereby he attains his objective in the field is by developing mobility through protected offensive power. He strives to attain freedom of movement and action through combining a variety of arms and weapons in such a manner that fighting power is expended economically, by which is meant the obtaining of full value for losses sustained and for energy and material used up.

It is obvious that changes in civil life must intimately affect the life of an army. It is equally obvious that changes in science, industry and engineering intimately affect the nature of weapons, and as long as these civil changes continue we must expect coincidental changes in weapons, and the means of movement and protection we employ. As weapons change so must tactics (the art of fighting) change, and as this art changes, so must organization and training change, just as they do in civil engineering and industry. Yet whatever these changes may be, our primary tactical function remains the development of mobility through protected offensive power. All other tactical functions are subsidiary to this one, because, in fact, it embraces them all.

From the close of the Napoleonic wars, that is when steam-power began to forge ahead and remodel civil life, right up to the outbreak of the Great War, we find a vast and never ending improvement in weapons, that is in offensive power, but we find no comparable improvement in means of protection--that is, other than through weapons themselves. Further, means of tactical movement remain unchanged, namely, muscular--human or animal.

Before the outbreak of the war this unceasing improvement in weapon-power threw tactical ideas out of focus. It was considered that mobility could be developed through offensive power alone, and that offensive power--that is, hitting--would provide its own protection. The primary tactical function was then shorn of one of its essential elements, and the result was that tactics became deformed. Immediately the war began human nature, the primary function of which is to cling to life and shun death, immediately readjusted the balance by suggesting the trench to the soldier, so that the protective element might be reintroduced.

Continuous
In the circumstances it was the only thing that could be done. Nevertheless, though offensive power was now protected, no mobility worth talking about could be developed from it. Gas, as a means of asphyxiating life in a whole area, was rapidly countered, and even the most powerful artillery bombardments resulted only in limited penetrations, and the formation of battle salient in which the attackers suffered more heavily than the defenders who held their outer perimeters. By these means the war could only be ended through attrition; tactics had ceased to be an art, they had degenerated into mathematical calculations of bullets and shells.

THE INFLUENCE OF PETROL

In the history of war, if it is not so today, it will one day be realized that the introduction of petrol-power marks a change as all embracing as the introduction of gunpowder. Gunpowder changed the form of war, but it did not change its primary tactical function. Before fire-arms were used battles were mainly assaults; after they were adopted they became attacks culminating in assaults. Armies advanced by roads, then deployed, frequently when in view of each other, then they attacked over two to three hundred paces of ground, and finally delivered an assault. In both cases mobility was developed from protected offensive power.

By the beginning of the present century, the range and accuracy as well as the volume of fire of weapons had increased to such an extent that the assault became the exception and not the rule. This was well

recognized after the Franco-Prussian and Russo-Japanese wars, with the result that tacticians saw that frontal attacks had become unprofitable therefore they advocated enveloping attacks instead.

FIRE-POWER INCREASED

In the Great War fire-power had largely been increased by the general adoption of the machine gun, and such vast numbers of soldiers were deployed that more frequently than not fronts became continuous, and, until they were broken, enveloping attacks were rendered impossible. The question of how to break the enemy's front, had therefore to be answered before mobility could be regained. It is here that petrol-power came to our assistance.

The influence of petrol-power on the war was so stupendous that it has not even today been fully appreciated. It changed the whole form of war, and it will continue to change it as surely as it has and is changing the form of civil life. Last year there were 22,000,000 motor cars in the United States alone, that is one to every five inhabitants. In this fact can be read to a very large extent the future of armies. Without petrol-power the great artillery battles would have been impossible, since the millions of shells fired could not have been carried forward from the railheads. Without petrol-power the aerial bombardments of London, Paris and other cities would have been impossible, and without it armored car and the tank attacks would have been unknown. It is with this last mentioned weapon that I will now deal.

Strictly speaking, the tank is not a weapon, it is an armored cross-country vehicle which carries weapons; it is, in fact, only a mobile machine gun, or gun mounting, just as a ship is. It was introduced and used during the war as an assault weapon, and since Infantry fire could not aid or stop its advance when it was used, the assault preceded the attack. Strictly speaking the Infantry attack ceased to be an attack, and became a follow-up or slow pursuit.

The weapon which assisted, or resisted, the tank was the field gun. As the war proceeded it became more and more obvious that, on ground over which tanks could move, Infantry, either to assist or resist a tank attack, was useless. Infantry, which since the introduction of gunpowder had become the queen of the battlefield, was relegated to the position it held during the Middle Ages. It could still fight in woods, swamps, and amongst hills, but its reign over the plains was at an end. This, in my opinion, is the supreme tactical lesson of the war: petrol-power enabled armor to be reintroduced, and armor enabled offensive-power to be protected, thus it enabled the primary tactical function to be reintroduced. It reestablished tactics as an art.

An art can only be appreciated by people possessing some knowledge of it, or by those born with an artistic temperament. In 1919, military artists were sadly lacking, and the result of this was that in place of taking the above lesson to heart all great armies went back to their 1914 military organization plus an extensive increase in small arm fire-power. It was not the bullet which was the decisive factor in 1918, it was armor, and since, in all civilized armies today, bullet-power is about three times as great as it was in 1914, we are in a worse tactical position that we were thirteen years ago. As far as I can see the only solution to this problem is mechanization.

What is our object in mechanization? It is to endow the army with a higher energy than it possesses today; it is to replace and supplement muscle-power by mechanical-power. The problem which faces us is identical to that which faced industry on the advent of steam-power. We have got to replace muscle-work by machine-work, and the energy latent in oil and petrol enables us to do so.

This energy enables us to attain a vastly higher degree of mobility. It enables us to carry more powerful weapons, and to supply them with greater quantities of ammunition, and it enables us to protect ourselves with armor. By means of petrol we can become artists of war; without it we can only remain foot-sloggers bullet-sloggers and bullet-slogged. It appears to me that there is no choice but that we must mechanize, and I will not enquire into how we should proceed.

THINKING IN FUNCTIONS

First and foremost we must get the present form of war out of our heads. What is this form? Battles waged by Cavalry, Infantry and Artillery. We must forget these arms, and no longer be chloroformed by their names, or organizations. We must cease to think in names and must learn to think in the terms of tactical functions. This is the first step towards rational, in contradistinction to chaotic, mechanization. For example, a carpenter has a bag of tools, but he does not think in terms of hammers, pliers, saws, etc., etc., but in those of the functions of these tools. He thinks of terms of boring holes, sawing planks, hammering in nails, etc. He uses his tools according to their powers. If you were to ask him which is his decisive tool, he would think you were mad, for each is superior to the other when properly used.

The functions of a carpenter are to bore, cut, hammer, pull and stick, and he possesses a variety of tools in order to carry them out. If anyone invents a new type of tool which enables him to carry out the function required more economically than with those he possesses, should he have the money to buy, he buys it, because his wages depend on his work; he does not get his back up and fight the new tool tooth and nail. Yet this is what the soldier does with every new weapon invented, frequently he looks upon an invention as a personal insult.

In my opinion, if efficiency and economy are our aim, the soldier must cease to think in names, and learn how to think in tactical functions, because functions remain the same, and names very frequently change. Thus, an archer, an arbalister, an arquebusier, an musketeer, and a rifleman are all names for men equipped with various weapons which possess the same tactical function, namely to discharge a missile from a portable piece of artillery--the bow, the crossbow, the matchlock, the flintlock and the rifle. Weapons change in form, and their names change accordingly; but functions remain constant in nature, but vary in degree. If we will persist in thinking out tactical problems in terms of Cavalry, Artillery and Infantry, then we shall render our minds rigid to all new ideas. To persuade our minds to become flexible and recipient we must think in functions.

What then are these functions? To answer this question all we need do is to think out our main requirements in battle.

First, we have got to find our enemy and simultaneously prevent him from finding us. Once we have found him we must hold him, that is we must attempt to restrict his mobility. Thirdly, we want to hit him, and, simultaneously, fourthly, we want to protect ourselves from his blows. Once we have exhausted him, fifthly, we want to smash him to pieces.

Here are five tactical functions, namely, *to discover, to hold, to hit, to protect and to smash*. In the past, discovery fell to the lot of light Cavalry and light Infantry; holding to light Infantry and Infantry of the line lightly protected by Field Artillery; hitting, to Infantry of the line supported by all manner of Artillery; and smashing, to heavy and light Cavalry.

Today we are faced by a host of new arms. Our aim as soldiers is to win a battle economically, or defend a position economically. Of these new arms the most important are: airplanes, tanks, armored cars, tractor-drawn and self-propelled artillery, antiaircraft guns, machine guns, and light automaties. Do not let us be petrified by their names, let us examine their powers and limitations, and then from these deduce their functions. Next we must compare their degrees of power with those of the older arms, and, when we have made our comparison, without prejudice we must decide which arms possess the highest degree of power.

THE INFLUENCE OF GROUND

In working out these comparisons, the deciding factor is ground, which possesses three tactical qualities: It aids or restricts mobility, offensive power and protection. Administratively, ground may be divided up into

roadbed and unroaded country, and tactically into plain land, undulating country, hills, mountains, forest areas and swamps.

Of the newer arms I mentioned above all, save the machine gun and the light automatic, are moved by petrol, and with the exception of the airplane, the rest are moved, or will in the near future be moved, on tracked, half-tracked or six-wheeled carriages, that is they will be able to move across country. Of these machines I will examine the tank as an example.

THE MODERN TANK

Of all existing arms the modern tank possesses the highest freedom of movement over plain land and undulating country, but swamps and thick forests may completely stop it, and in hilly and mountainous regions its mobility may be restricted to a small number of easy approaches. On ground it can negotiate it has nothing whatever to fear from Infantry as today equipped, it has little to fear from any projectile throwing weapon with inferior mobility to itself. Even in 1918, on the Western Front, where no flanks could be found, and where guns could never be avoided, no well and strongly mounted tank attack failed to smash the German line, and in 1918 tanks were slow moving machines. To equip Infantry with an antitank weapon is of some use, but if this weapon is to be really effective it must be able to move as fast as any tank, but as it has to protect Infantry it cannot move far from them. Tied to slow moving Infantry such weapons may be compared to destroyers escorting a convoy at sea, their tactical radius of action is extremely limited.

I do not wish to labor this question, for to me the answer is self-evident, namely, that on country suitable to tanks, the tank can hold and hit more economically than Infantry can, and by holding I do not mean sitting on a position but taking up a position which will prevent an enemy from moving from the one he is sitting on. For example, it is not necessary to enter a man's house to hold him in it, all that is necessary is to cover the front and back doors by a rifleman from outside.

As regards discovering, that is reconnaissance, I have frequently heard it said, that the tank is unsuitable, since it is a blind machine. I admit that the Vickers tank may not be the most suitable type of reconnaissance machine, but that it is of necessity blind is sheer nonsense. An Infantryman in a trench is normally blind, but in a tank on reconnaissance duty there is no reason why its commander should not stand with his head and shoulders completely outside his machine.

For smashing purposes, tanks are obviously more suitable than cavalry, since they are impervious to bullets, and for protective work, though they can largely protect themselves, there can be little doubt that they should be supported by artillery. As this artillery cannot be horse drawn, it must consist of either tractor-hauled guns or self-propelled ones. Of these two the second are obviously the most suitable.

We arrive therefore at this conclusion: That on open and undulating country mechanized arms will carry out the tactical functions far more economically and effectively than the older ones, because they are able to develop a higher mobility on account of their superior protected offensive-power, which is the primary tactical function itself. As to this there can be no doubt in my mind, for it is a matter of common sense.

In wars against civilized nations, plain land and undulating country is undoubtedly more important strategically and tactically than mountainous. In a war of the first magnitude I know of no decisive battle which has been won or lost in a mountainous area. Nevertheless we must be prepared to fight in these areas, for many subsidiary operations will take place in them. It is obvious that though tanks and similar weapons can assist in these localities, the arm which can most effectively move in them is Infantry supported by mountain artillery.

Thus by testing the tactical values of the mobility, offensive and protective powers of arms and weapons by the various categories of ground met with in war we arrive at an answer of no little value, namely that in the future we must divide each battlefield into two main tactical areas: areas suited to the movement of

mechanized arms and areas not so suited. Then, whenever possible, if we distribute our arms accordingly, shall we attain the most economical results. For brevity's sake I will call these two areas tank areas and Infantry areas.

CHANGES IN ORGANIZATION

If this deduction is accepted, and I fail to see how it can be refuted, the next problem in mechanization is to organize an army so that it can maintain the primary tactical function in both the above areas.

In the tank areas we want four if not five main types of machines. To give them old names, we want light Cavalry, light Infantry, Infantry, Artillery and heavy Cavalry, or to call them after their tactical functions--a reconnaissance tank, a holding tank, a hitting tank, a protecting tank and a smashing tank. The First class should consist of armored cars, six-wheeled and possibly also half-tracked, and light one or two men tanks. The second class of machines somewhat similar to the present Vickers tank; the third, to the new heavy tank; the fourth should consist of self-propelled guns; and the fifth of extremely fast machines, of which no model as yet exists.

In my opinion, the third and fourth classes will eventually coincide. Then we shall get four main classes which according to their tactical functions may be compared to destroyers, light cruisers, battleships and battle cruisers.

In the Infantry areas the tactics and organization of the older arms will have to be radically changed, for whilst in the past it was the exception for these arms to fight in mountainous country, and the rule to fight over plain land and undulating ground, these will not be reversed. In these areas we require a true light Infantry, light Cavalry and light Artillery. We require a very flexible and mobile organization, very intelligent and lightly equipped men and few heavy guns.

The Infantry of the future have a far more difficult task to carry out than they had in the past, yet it is a far more interesting task, and a task which will require so highly trained a soldier that few, if any, conscript armies will be able to provide him. Reconnaissance will be the duty of the light cavalry, holding of light cavalry and riflemen; hitting of riflemen and light automatic gunners; protection of machine gunners and mountain artillery, and smashing of light cavalry, riflemen and cavalry machine gunners. It will be seen, therefore, that the changes in the organization will be considerable. Not only does the future demand different types of soldiers for different operations of war, in which there is nothing new, but an organization which will include two categories of soldiers, each of which moves at a different pace. The nearest simile to this that we find in history is during the Seventeenth Century when sieges were more frequent than field battles. Then the field army of the day was followed by a slow moving siege train.

The siege train of the future is the nonmechanized arms, arms which storm mountains and forests in place of fortresses and castles. The field army is the mechanized force.

SUMMARY

I will now briefly summarize what I have written. The probabilities are that in the future petrol-power will revolutionize the art of war as extensively as did the introduction of fire-arms. Whatever this revolution may be, the object of battle will remain the attainment of economical victory through mobile protected offensive power. This power is developed by means of weapons, the use of which should be governed by their respective powers and limitations.

The older arms are all directly limited by muscular-power; the newer break away from this limitation, since petrol enables a higher mobility, offensive power and protective power to be attained. Petrol consequently, must change the present form of war. How will it change it? The answer to this question demands clear thinking.

To think clearly we must cease thinking in names of weapons and arms, for if we do so we mentally shackle ourselves. In place we must think in tactical functions, and abandon any idea of the discovery of a universally decisive arm, for such an arm is as mythical as the universal solvent of the alchemists. Each arm is superior to any other arm when conditions permit of it developing greater effect.

The tactical functions are finding, holding, hitting, protecting and smashing, and the side which can develop the higher mobility will obviously have time in its favor.

Which weapon will in any set of conditions prove the superior weapon depends very largely on the nature of the ground. Ground may be divided into two areas: Tank areas and Infantry areas, from which two main categories of tactics can be developed, namely plain warfare and mountain warfare. Finally, history is a great mental laxative, it frees our minds from shibboleths, and happily it has a habit of repeating itself. In the Middle Ages the knight in his armor ruled the plains, and the staunchest Infantry came from Switzerland, Scotland and Wales. Yet there was nothing new in this, for in the days of Joshua the Canaanites with their chariots of iron were masters of the valleys, while the children of Joseph held fast in Mount Ephraim.

Discussion

*By Brig. Gen. S. D. Rockenback
Commanding General, District of Washington;
formerly Chief, Tank Corps, U.S. Army*

To get a clear understanding of the above article by Colonel Fuller, leading exponent of mechanical warfare, it is necessary to keep in mind that it is a prophecy, but in view of the great improvement in the gas engine and the reduction of friction, this prophecy is well founded and may come true six months after the production of a fast, durable tank. Mechanical warfare will not, as the romancers predict, do away with armies, for tanks and other fighting machines are auxiliaries of limited employment and where they can be employed; their destructive power while controlled by a few men exposed to death is made by many men, in repair shops and in factories. One hundred light tanks on a 10,000 yard front, manned by two hundred men, may perform the work of 10,000 riflemen, but the total number of men unexposed, required to keep those tanks operating efficiently in battle will be large. Mechanical warfare reduces casualties by replacing human power with mechanical power.

Colonel Fuller contends that to attain the degree of artist in the art of war, to conduct battles economically, we must mechanize, obtain the machines that science and industry have made available, and intelligently use them for the saving of life and sinew.

The recent German pronouncement, that the latest developments in tanks have brought us to the threshold of a new tactics, is expanded and broadcast. While even the enthusiastic among us for mechanical warfare may not be able to accept in toto the views of the extremist, he will certainly cause us to bestir ourselves and bring us to the realization of the fact that commanders will be held for an economical expenditure of their fighting power. We can no longer just muddle along and accomplish our mission regardless of the expenditure of men.

It is believed that the Americans have the right conception: The Infantry being the only arm that can function under all conditions of terrain and weather, reliance must be held on it; all other arms and services are auxiliaries to the Infantry and must be trained to facilitate the advance of the Infantry. Our commanders have that conception and do not think in terms of cavalry, artillery, airplanes, or tanks. Under favorable conditions for the employment of Infantry, the commander uses such of his auxiliaries as are best suited to the situation to facilitate the advance of his Infantry. In other words, as so aptly stated by Colonel Fuller, he restores his mobility through protected offensive power.