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The Prospects of Development of Armored Combat Vehicles

by

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Now, perhaps, no one will oppose the tenet that the tank troops are best suited for conducting combat operations under conditions of a nuclear/missile war, that they, better than other arms of troops, can exploit the results of our own nuclear strikes against the enemy and have the most protection from enemy nuclear counterstrikes, and that they have great striking power and high mobility, as a result of which they are the basic strike force of the ground troops. Obviously it is not necessary to prove the dependence of all these qualities on the level of development of the armored equipment with which the tank troops are armed.

At the present time, because there is a rapid development of military equipment in general, and armor in particular, the danger that may arise as a result of losing qualitative superiority over the enemy from an equipment standpoint becomes apparent. In connection with this, it is necessary to emphasize that the greatest differences of opinion concerning military-technical progress are observed in the definition and determination of the actual directions of development of armored equipment.

In this connection, the statements of several authors in the pages of the Journal "Military Thought"*, concerning questions of future development of tanks, deserve serious attention.

A lot of attention was also devoted to these questions at the military-scientific conference that was conducted at the Military Academy of Armored Troops at the end of May 1961.

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* Note: We have in mind the articles of Marshal of Armored Troops P. Rotmistrov and General of the Army A. Zhadov, Special Collection of Articles of the Journal "Military Thought", First Issue, 1961, and Lieutenant-General N. Slyunin, Collection of Articles of the Journal "Military Thought," No. 1 (56), 1961.

This article will expound on the prospects of development of basic types of armored combat vehicles that meet the conditions of utilizing tank troops in a nuclear/missile war.

Tanks

Despite the fact that tanks, in comparison with other equipment, have turned out to have the greatest ability to withstand nuclear bursts, new tanks have to be created, mainly taking into consideration a further increase in the effectiveness of their utilization in a war with wide-scale use of nuclear weapons and missile means.

The basic data on modern Soviet and foreign tanks are given in Table 1.

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Basic Data for Modern Soviet and Foreign Tanks

Type of Tank		Medium						Heavy			Light				
Country		USSR	USA	USA	UK	UK	West Germany, France	USSR	USA	UK	USSR	France	USA	USA	UK
Model		T-55	M60	T95	"Centurion" X	"Chieftain"	Experimental Model	T-10M	M103	"Conqueror"	PT-76	AMX13	M41	T92	Experimental Model
Weight in Tons		36.5	46.3	32	51	45	35	51.5	57	65	14	14.5	22.7	16.2	20
Crew, number of persons		4	4		4			4	5	4	3	3	3	3	3
Dimensions in meters	Length	6.3	6.9	6.4	7.6			7.3	7.0	7.9	6.9	4.9	5.8		
	Width	3.3	3.6	3.2	3.4			3.5	3.7	3.9	3.1	2.5	3.3		
	Height	2.4	3.1	2.3	2.9	2.3		2.4	3.2	3.2	2.2	2.1	2.8		
Caliber of Gun in mm		100	105	105	105	120	105	122	120	120	76.2	75	76.2	76.2	83.8
Penetrating ability at 1000m, in mm		185	300	300	300	370	300	225		370	80	150(600 for guided missiles)	150	150	180
Unit of fire, number		43	55		60	40		30	34	35	40	37(4 guided missiles)	57		
Rangefinder		-	+	+				-	+	+	-	-			
Stabilizer		+			+			+		+	+				+
Automatic loader		-		+	Ejection of shell case			Rammer		Rammer, Ejection of shell case	-	+	-	+	
Thickness of armor in mm	Turret, (bow)	200	203		152			250	200		10-15	40	51		Light alloy
	Glacis plate	200	284		152			273	250	280	10-15	40	51		Light alloy
	Side	80	90		51			80-120			10-15	20	25		Light alloy
Special anti-atomic protection (PAZ)		+	+		+			-			-	+			
Maximum speed, km/hour		50	46	55	35		55	50	34	34	44	70	64		65
Cruising range in km*		350 (500)	420		200	350		240 (350)	130	150	250	300	250	350	200

* For the Soviet tanks the cruising range given in the parentheses takes into consideration the use of extra tanks.

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The variety of combat tasks entrusted to tanks makes it necessary to broaden their combat qualities in such a way that they cannot be incorporated in one model. At the same time, because of economic and purely military considerations it is necessary to strive to reduce the number of essential tank types to a minimum.

Even though it is impossible to create a single universal type of tank in modern conditions, in the tank parks of all the armies a tendency is observed to find a basic type, the combat qualities of which would permit its utilization for performing quite a wide range of combat tasks. The other types of tanks will be more specialized in their characteristics.

In the foreseeable future, taking into consideration the development of armored equipment by our probable enemies, it is advisable to improve further our light, medium (basic), and heavy tanks, to develop artillery combat vehicles and also create infantry combat vehicles, which will probably replace the present armored personnel carriers in combat subunits of motorized rifle units and large units. Besides these combat vehicles, it is necessary to produce combat vehicles of special designation in more limited quantities (command vehicles, bridge layers, flame throwers, and others), built on the chassis of tanks.

A cutback of specialized production and a decrease in the inventory of spare parts must be achieved by creating a "family" of vehicles based on the components and mechanisms of mass produced types of tanks, with the maximum uniformity and standardization of components, mechanisms and other equipment both within the "family" and among the vehicles on which they are based.

The medium tank, being the basic tank and the one found in the greatest numbers, must fulfil the widest range of combat tasks. These tanks form the basis of the combat power of the major tank large units and formations, intended for performing independent operational tasks. In the composition of the motorized rifle units they are used for direct support of infantry. This great range of combat tasks being fulfilled makes the problem of determining the basic specifications of the medium tanks quite difficult and critical. The difficulty of resolving it is indicated by the fact that, for a decade (1937 to 1947), in the British army it was considered impossible to create one type of medium tank, as a result of which the major tank large units were armed with high-speed

"cruiser" tanks and slow "infantry" tanks which were issued for direct support of infantry.

From the nature of the combat operations of medium tanks it is apparent that combat with enemy tanks will be unavoidable for them and will be one of the most important missions. Therefore the weapons of these tanks must first of all be antitank, capable of destroying the basic tanks of the enemy. Besides, it is called upon to fulfil many other fire tasks (for example, the incapacitation of personnel in armored personnel carriers and in shelters). Consequently, the armament of medium tanks must be versatile and multipurpose.

With the improvement of the means of antitank defense and the increase of the combat qualities of enemy tanks, firepower increased, the thickness of the armor increased, and the weight of medium tanks increased correspondingly. At the present time the weight of our tanks of this type has reached 36 tons, in West Germany (experimental model) - 35, in Japan and Switzerland - about 35 tons. In the USA and the UK, the combat tasks of medium tanks are fulfilled by 46 to 50 ton tanks.

Research carried out by industry and in the Military Academy of Armored Troops shows that with the retention of tube artillery systems for the armament of the tank, the optimum combat weight of a medium tank in the next few years will be approximately 36 tons. It is highly undesirable to increase further the weight of the medium tank. But it is also completely unacceptable to reduce the weight at the expense of its protective features.

Reduction of the weight of a medium tank, with simultaneous improvement of its protective features, an increase in its mobility, and the growth of its firepower may clearly be achieved by switching over to guided missiles. However, for the time being, the basic armament of a medium tank will be a gun. At the present stage of guided missile development, they still cannot satisfy two contradictory requirements - versatility and antitank effectiveness. In connection with this (as a stage in the assimilation of guided missiles), it would be interesting to combine a powerful antitank gun with guided missiles (URS). In this case the latter must be located inside the tank and be launched by means of a gun. They (URS) will be used for destroying enemy tanks at great distances, i.e., it will be a specialized supplement to the basic (gun) armament of the tank.

In order to increase the firepower of the tank it is necessary to have a rangefinder and automatic loading, equipping it with a night sight and devices for night vision that work without special lighting.

The armor of the tank must ensure reliable protection from mass antitank weapons and the best possible protection from the basic tank and antitank guns of the enemy.

It is necessary for the medium tanks to have high mobility in order to ensure swift tempos of the offensive, the best utilization of conditions created by the delivery of nuclear strikes against the enemy, and for rapid dispersal when there is a threat that the enemy will use these weapons. The necessary mobility, with the possibility of attaining average speeds of movement over the terrain of about 35 to 40 km/hour may be achieved in tanks with the utilization of improved transmissions with automatic or semi-automatic drive, and with the creation of a suspension that ensures a very smooth ride. Moreover, the maximum speed of the tank should be 70 to 75 km/hour, for which it is necessary to increase the power of the tank by approximately 25 HP/ton.

In order to increase the maximum effective range of the tank troops, the cruising range of the tank must be substantially increased in comparison with that which has been achieved in our modern medium tank.

The tank must have effective special antiatomic protection (PAZ) from all the destructive effects of a nuclear burst. Special attention should be given to increasing the biological protection of the crew from penetrating radiation.

Fundamental improvements in protecting tanks from all the various modern destructive means must be found in completely new elements, in particular the compact accommodation of a reduced crew. In this case, it will be much simpler to carry out the appropriate complex (armor and biological) protection of the crew, without detriment to the other combat characteristics of the tank.

The tank must be suited for moving along the bottom of rivers with the aid of simple equipment for underwater driving (OPVT) and for floating with the use of individual means of flotation.

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Heavy Tank. In modern conditions the heavy tanks that have, in comparison with the medium tanks, more powerful armament and considerably better protection, are a means of qualitative reinforcement of the medium tanks, and are the most powerful weapon for combating the tanks of the enemy.

The qualitative reinforcement of medium tanks, as is known, may be attained with the assistance of heavy tanks or assault guns created on the chassis of the medium tank and differing from it by having more powerful armament. The first method is preferable. The powerful armament of the heavy tanks increases the possibility of their combat utilization, especially in offensive operations.

With the adoption as armament, by our probable enemy, of 105mm rifled guns that have quite a high muzzle velocity of subcaliber projectile, as the basic artillery weapon of its mass-produced types of tanks, with the presence of various means for reinforcing them, it becomes necessary to create qualitative means for reinforcing our medium tanks in the form of heavy tanks or other combat vehicles that differ from the medium tank, at least by the fact that they have more powerful armament.

Since the basic task of the heavy tanks will be the destruction of enemy tanks, they will, to a greater degree than the medium tanks, be better suited for the installation of guided missiles (URS) as their main armament. The use of URS opens the most effective path for increasing the firepower with a sharp improvement in protective features.

The future development of the heavy tank depends on increasing its firepower, increasing its armor protection, and ensuring a more effective system of antiatomic protection than other types of tanks have. An increase of the combat qualities of heavy tanks must be achieved by implementing new decisions on specifics, based on the use of new armament.

Light Tank. The broadening of the sphere of tank use in conditions of a nuclear/missile war makes it necessary to have well-armed light tanks, among which it is possible to single out the following types: reconnaissance, antitank and tanks of airborne troops.

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Reconnaissance combat vehicles perform intelligence, combat security, pursuit, and communications tasks. Their distinguishing features are high mobility and cross-country ability. In order to achieve these qualities, striving to get low weight, firepower and protection are sometimes sacrificed. However it should be kept in mind that with the fulfilment of the task of security with such vehicles, it is often necessary to halt enemy tanks at favorable lines, and to be subjected to the effects of various fire means during pursuit.

Antitank combat vehicles are an important supplement to the heavy tanks, as a highly mobile antitank reserve. They can, in a very short period of time, be moved in a sufficient quantity to the point of an enemy tank breakthrough, for example, into the zone of a nuclear burst. The quickly created antitank screen will slow down the enemy advance before tanks with more powerful armament arrive. With the limited weight, these vehicles will have relatively weak armor protection and will be inferior to the medium (basic) ones in respect to firepower. If it is necessary to have multipurpose armament for the reconnaissance vehicle, then, for similar vehicles, it is possible to use guided missiles, even some of the simpler ones.

Airborne landing tanks are necessary for the airborne troops. A landing is an important target and will definitely be attacked by enemy tanks. It must be capable of maneuver and must have an adequate strike force to capture important objectives. Low weight and unavoidable limiting of armor and firepower are obvious for the airborne troops' (VDV) tank. At the same time it is assigned quite complex tasks. They need armament that is both versatile and quite effective from the antitank standpoint. The armor must provide protection from the fire of large-caliber machineguns and small-caliber automatic guns. It is very difficult to combine all these characteristics. But if an effective airborne landing tank is created, it will be able to fulfil the functions of both a reconnaissance and a light antitank vehicle. Obviously such a multipurpose light tank must have a 76 to 85mm caliber gun, capable of destroying the basic enemy tanks (mainly their side armor) at medium distances. As an additional antitank weapon it may have several guided missiles of the simplest design, located, for example, on the turret and guided by wires. The tank must have automatic loading and be equipped with a rangefinder.

The maximum speed of such a tank must be higher than that of medium and, especially, heavy tanks. We should recall one of the lessons of the last war: light tanks, that were inferior to the medium ones in respect to mobility, were found to be useless for fulfilling combat support tasks. Seeing that their armament (37 to 45mm guns) did not constitute any danger for the medium tanks, not to mention the heavy, production of our light tanks was halted in 1943, and in Germany a year earlier.

The system of antiatomic protection of the tank being proposed must consist mainly of carrying out hermetic sealing, introducing a filtering-ventilating installation, pressurizing the crew compartment, and ensuring simple decontamination.

In this tank, ensuring flotation will be of special concern, as this is contrary to the striving for compactness and small size. It is possible that this question will be resolved with the aid of stationary blocks of foam plastic (penoplast) or by other means with which it is possible to attain a temporary (during the time of floating) increase in water displacement.

It is necessary to note that the most successful light tank will not be able to replace the basic tank in an offensive operation. Of course the light tank will be cheaper than the medium one, but it will remain a specialized combat vehicle that is inferior to the basic (medium) tank in the complex "fire power-armor protection" that defines the effectiveness of a tank in a fire fight.

Infantry Combat Vehicles

At the present time the explanation of the basic tactical-technical qualities of a special combat vehicle for the infantry deserves very serious attention, the need for which, in conditions of a war with the use of weapons of mass destruction, is apparent.

The difficulties in determining the basic features of such a vehicle are explained by the fact that it must be the combat vehicle that is mass produced in the largest quantities, with the requirements and limitations that arise there from, imposed, first of all, by economics. At the same time, this vehicle must ensure the conduct of vigorous combat operations during the use of nuclear/missile weapons, the requirements of which cannot be satisfied by regular armored personnel carriers that are just a means of transport.

The variety of approaches cited for determining the basic features of the infantry combat vehicle makes it necessary for us to dwell on this question in greater detail.

Up to the present time the infantry is a necessary arm of the troops, even though its role and significance in the ground army has essentially changed. The basic strike force role passed from the infantry, first to the artillery (World War I), then to the artillery and tanks, and finally to nuclear/missile weapons and tanks. In examining the offensive operation, it may be said simply that the infantry is given the final functions after the enemy is subjected to strikes by the strike arms of the troops, and also the final assimilation of the captured territory. 50X1-HUM

The essence of combat utilization of infantry is the individual actions of individual soldiers within the framework of the organized collective. The infantry is capable of destroying the enemy to the last soldier, i.e., to bring the battle to an end, while the strike arms of the troops, as a rule, perform the cardinal, basic tasks of the battle, but do not bring it to an end.

Besides performing the functions of bringing things to an end, the infantry, in some cases, creates opportunities for using the strike arms of the troops, and carries out combat operations under conditions where the use of strike arms of the troops is not expedient (for example, when operating in mountains).

Under conditions of a nuclear/missile war, the infantry will not be able to fulfil its inherent functions with its old weapons. On the battlefield it must be mobile (motorized) and to a certain extent protected from a nuclear burst and its effects (armored). This can only be achieved with combat vehicles that are specially constructed for the infantry. It is of special importance to have such vehicles for the infantry in the tank troops.

Thus, infantry combat vehicles (PBM) are combat vehicles with the use of which the infantry retains its inherent peculiarities for conducting battle and acquires the protection and mobility on the battlefield that it lacks. In our opinion it is completely incorrect to examine the PBM only as a means for coordinating the infantry with the tanks, or as the means of transport to the field and partially on the battlefield. Infantry combat vehicles - are the basic infantry means

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for carrying on combat in modern conditions. Therefore they must be constructed in such a way as not to limit, but on the contrary, to develop the positive qualities that are inherent to the infantry, thanks to which the infantry varies from the other arms of troops and justifies its existence.

Maybe the best solution of this question would be the creation of individual armored mobile vehicles, equipped with weapons, for a single soldier. However, at the present time this solution is impossible due to technical and economic considerations.

Proceeding from this, it is possible to formulate approximate requirements for the modern infantry combat vehicle.

It is visualized in the form of an armored (it must be closed and hermetically sealed) mobile, amphibious vehicle having high cross-country ability and holding several soldiers. The crew (landing force) must, to a certain extent, be protected from the effects of a nuclear weapon and its after-effects (thermal radiation, radioactive substances and others). While in the vehicle, they must have the opportunity to use their individual weapons. It is advisable to foresee the possibility of convenient and covered dismounting.

Obviously it is expedient to limit the size of the crew (landing force) of such a vehicle to a squad - the minimal TOE unit. A smaller crew (landing force) will lead to an undesirable increase in the total number of such vehicles, and a larger one will turn the infantry combat vehicle into a personnel carrier, where, in a number of cases, incomplete combat use of the entire landing force concentrated in the vehicle will be observed, and with its destruction the personnel will suffer heavy losses. Besides the landing force, the PBM must have a mechanic-driver and an operator for the fixed armament. The latter must remain in the vehicle in order to give fire support to the dismounted landing force. Therefore, total size of the crew (landing force) will be 7 to 10 persons.

The armament of the PBM must ensure the destruction of similar vehicles of the enemy, emplacements, and personnel. The individual weapons of the landing force, even if it is possible to use it actively in combat, cannot fulfil all these tasks. It is only capable of incapacitating enemy personnel, and even then at an insignificant distance. Therefore it is recommended to have fixed, light armament on the vehicle.

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The fixed armament must be compact and have the ability to conduct all-around fire (360°), not require an increase in the size of the vehicle, and not decrease the ease of accommodating the landing force.

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If such armament requires a special combat compartment with a rotating race (pogon) having a diameter of 1300 to 1500mm, this will complicate and increase the weight of the PBM, and will turn it into a combination artillery combat vehicle and armored personnel carrier. This will result in an unjustified complex vehicle which it probably will not be possible to create on a mass scale.

Apparently the most appropriate armament for the PBM will be a small-caliber automatic gun (20 to 30mm caliber) which will sometimes even destroy tanks. It should be kept in mind that fragmentation shells of a small-caliber gun give a substantially greater effect than a large caliber machine gun. The gun must be reinforced with a regular machine gun.

With light guns, it is possible to install several infantry-type antitank guided missiles (PTURS) at the sides of the turret.

For effective utilization of the small arms of the landing force, the riflemen can best be located along the vehicle, facing the sides, which should have ports and embrasures provided in them.

An infantry vehicle that is mass produced, compact, and if possible, light, cannot have armor capable of withstanding shells. It is advisable to protect the PBM from the fire of large-caliber machine guns, otherwise they will stop it just as easily as the standard machine gun stopped the infantry in World War I. The glacis plates of the PBM must have a design thickness of about 35 to 40mm. The sides cannot be the same, or the vehicle cannot be amphibious. However, 13mm sides will ensure protection from the fire of standard machine guns and, within the limits of a target angle of ± 30°, from the fire of large-caliber ones also.

The special protection of the PBM must include the hermetic sealing of the body and a filtering-ventilating system for the collective protection of the crew from radioactive substances, and chemical and bacteriological weapons. It is not obligatory for the PBM to have higher speeds (average and maximum) than the tanks, but in principle they are helpful. Obviously, the power rating of 20 HP/ton and a maximum speed of 70 to 75 km/hour will be adequate for it.

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The cruising range should not be less than for tanks. The cross-country ability of the PBM should be no worse than that of the tanks. Fundamentally this can be ensured with tracked or improved wheeled running gear.

Without going into detail regarding the advantages and disadvantages of tracked and wheeled running gear, we will only point out that a thorough analysis shows that it is expedient to use tracked running gear on the PBM. With tracked running gear it is possible to have a simpler transmission, running gear, and body, and it is considerably easier to make them buoyant by using ordinary caterpillar tracks for this purpose. With other conditions equal the vehicle has smaller dimensions and weight. On the whole these parameters for a mass-produced vehicle are decisive and the necessary assurance of a caterpillar track service period of 8000 to 10,000km is not a problem for a light vehicle. This problem can be resolved fairly easily by using rubber and metal couplings.

The comparatively low weight of the infantry combat vehicle permits making it amphibious. Since the attainment of high speeds in water is not an obligatory requirement of the PBM, its buoyancy in water can be achieved by using ordinary caterpiller tracks.

Seeing that the infantry combat vehicle must be the vehicle found in the army in the largest numbers, it is necessary to strive for it to be of minimal weight, simply constructed, and cheap, so that it would be possible to make wide-scale use of standard components of the automobile-tractor industry.

All this makes great demands on the space allocation (komponovka). If the quality of the allocation in the tank is evaluated by how much of the interior volume of the vehicle is left for the combat compartment, then for the PBM the largest portion of the interior volume should be devoted to personnel.

The space allocation of the PBM must be original. It is doubtful that the chassis of other vehicles (for example, of the reconnaissance tanks) can be used for it. On the contrary, it is more likely that on the chassis of this mass produced vehicle other vehicles in the same weight category, may be created.

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In principle it is possible to have two logical arrangements of such vehicles. The first - the motor and transmission complex and the mechanic-driver are located in front, occupying 1/4 to 1/3 of the vehicle length; the other space remains free for accommodating the landing force and armament; the rear is made in the form of a hinged ramp.

The advantages of this arrangement are the ease of accommodation and convenience of disembarking the landing force, and the wide possibility of using the chassis of such a vehicle without substantial alterations (thanks to the presence of vacant space) for command-staff, reconnaissance, medical, transport, and other vehicles. However, with this arrangement it is difficult, when the vehicle is floating, to distribute the weight of the heavy nose section to the rear. Besides, the vehicle becomes rather long.

The second arrangement - the motor and transmission complex are located in a narrow tunnel along the center line of the vehicle, with the motor in the rear section and the transmission in the forward part. The landing force is located along the sides of the vehicle with their backs to the tunnel. In order to decrease the width of the vehicle it is possible to turn the soldiers of the landing force slightly forward. The armament and its operator are installed in the forward part of the vehicle, along with the mechanic-driver. The rear is made in the form of a hinged ramp, the same as for the first variant. This arrangement permits obtaining the minimum length and floating balance, but it is inferior to the former in versatility (because of the tunnel along the center line of the vehicle).

Working this out with sketches has shown that the PBM in the tracked version, that fulfils all the requirements examined above, may be created with a weight of 8 to 10 tons.

It should be said that in the armies of the USA, West Germany and France, a considerable amount of attention is given to developing infantry armored personnel carriers.

So far the US Army is concentrating exclusively on tracked vehicles. It is assumed that all the infantry will conduct combat operations in armored personnel carriers.

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Ths Bundeswehr is only beginning to create a pool of armored personnel carriers and is also concentrating on tracked vehicles. Moreover, they make wide-scale use of the French and Swiss experience. In West Germany they also operate on the principle that infantry must operate in armored personnel carriers.

Several armored personnel carriers have been introduced as armament in the French army, but they are produced in a limited quantity. The appearance of the wheeled, armored personnel carrier "Panar" must be viewed only as an attempt to test the possibility of creating an armored personnel carrier on the chassis of the reconnaissance armored car "Panar".

So far the British army does not have any tracked armored personnel carriers. The basic vehicle of this type is the wheeled armored personnel carrier "Saracen". It should be said that in it, to a certain extent, it was possible to combine a moderately complex chassis with satisfactory cross-country ability.

Table 2 presents data on modern vehicles that are used for the infantry. The majority of them are still just a means of transport, and do not provide the infantry with the opportunity to carry on combat operations under the new conditions. However, some of the foreign vehicles mounting appropriate armament may approach the prospective PBM that we have examined.

Let us dwell on individual models of armored personnel carriers.

The Soviet wheeled, armored personnel carrier BTR-152 does not stand up to criticism. In the pursuit of an economic commercial chassis, a vehicle was created that does not satisfy the given requirements as regards cross-country ability, unit power rating, and several other parameters. The combat qualities of this vehicle equate with the level of armored personnel carriers used in the years of World War II.

The tracked, armored personnel carrier BTR-50PK possesses a more improved design, but neither does it satisfy many requirements. Without dwelling on its merits, let us note the faults. In actuality, this is a means of transport for carrying a landing force of 20 persons. The latter are accommodated in crowded conditions in the central part of the vehicle and, located there, they cannot participate in combat. Dismounting of the landing force is difficult. The vehicle does not have fixed armament. The glacis plate is not thick enough. The arrangement of the vehicle is poor

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for use as a PBM - with the large size of the vehicle the landing force is accommodated on a "postage stamp". This is a result of using the chassis of an amphibious tank. The special propellers for traveling through water are an unnecessary luxury for a vehicle of this type. On the whole the design of the armored personnel carrier is complex, heavy, and also quite expensive. Finally, its mobility (speed, cruising range) leaves much to be desired.

Some of the most successful foreign models appear in a much better light, even though they also have faults. Here we have in mind the vehicles M113 (USA, Illustration 1); "Hotchkiss" (France, West Germany, Illustration 2); "Hispano-Suiza" (West Germany, Switzerland, Illustration 3); and "Pirate" (Switzerland). These armored personnel carriers have the smallest size and weight. The landing force (approximately a squad) is conveniently accommodated in the enclosed body and can, to a certain extent, participate in combat. Convenient dismounting is provided through a ramp at the rear. They make wide-scale use of motor vehicle engines and transmissions. Some vehicles ("Hotchkiss", "Hispano-Suiza") have an automatic small-caliber gun (with a muzzle velocity of 100 meters/second). The others have a large-caliber machine gun in a rotating turret. Some of the models (AMX, "Pirate", M113) are equipped with a PAZ system.

The AMX armored personnel carrier cannot be counted with the best, despite a number of good features (for example, the armor), as a result of a somewhat excessive landing force and great weight. The wheeled, armored personnel carrier "Panar" has a very unique design, but due to its great complexity (which is probably not acceptable for a mass-produced vehicle), it is only interesting from the technical standpoint.

The PBM that our army needs must considerably surpass the best foreign vehicles that have been examined. Here, it must be considered that it will still only be under development, and that these vehicles are already introduced into the armament, and will probably be improved. Therefore, there should be a large measure of qualitative superiority in its makeup, such as: very small dimensions and weight with convenient accommodation of the landing force, armament (free rockets), that is even capable, if necessary, of destroying tanks, adequate armor protection from large-caliber machine guns, and together with all this, it should be amphibious.

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Basic Data on Modern Soviet and Foreign Armored Personnel Carriers

Country		USSR	USSR	USSR	USA	UK	France	France	West Germany, France	West Germany, Switzerland	Switzerland
Model of armored personnel carrier		BTR-50PK	BTR-152K	BTR-60P	M113	"Saracen"	AMX	"Panar"	"Hotchkiss"	"Hispano-Suiza"	"Pirate"
Type of running gear		Tracked	Wheeled	Wheeled	Tracked	Wheeled	Tracked	Wheeled	Tracked	Tracked	Tracked
Weight in Tons		14.3	8.9	9.9	10.1	10.2	13.5	13.5	6.4	12.5	11.2
Dimensions in meters	Length	7.1	6.8	7.1	4.8	5.0	5.5	5.6	3.7	5.3	5.3
	Width	3.1	2.3	2.87	2.66	2.5	2.5	2.4		2.5	2.4
	Height	2.0	2.1	2.1	2.2	2.4	2.3	2.1	1.9	2.1	1.95
Landing force and crew, persons		20+2	16+1	15+1	10+2	10+2	12+2	13+2	5+2	9+2	11+1
Armament		-	-	-	12.7mm machine gun	7.5mm machine gun	12.7mm machine gun	12.7mm machine gun	20mm gun	20mm gun	
Thickness of armor, mm	Glacis Plate	10÷13	6÷13	6÷10		13	30	40		30	20
	Side	10÷13	6÷13	6÷10		13	20	15		15	12
	Rear	10÷13	6÷13	6÷10		13	15	15		10	10
Special antiatomic protection (PAZ)		-	-	-	+	-	+				+
Maximum speed, km/hour		44	65	80	64	70	60	100	65	65	65
Cruising range, km		250	550	600	320	360	340	600	350	300	300
Amphibious propulsion		water jet drive	-	water jet drive	Tracked drive	-	-	-	-	-	-

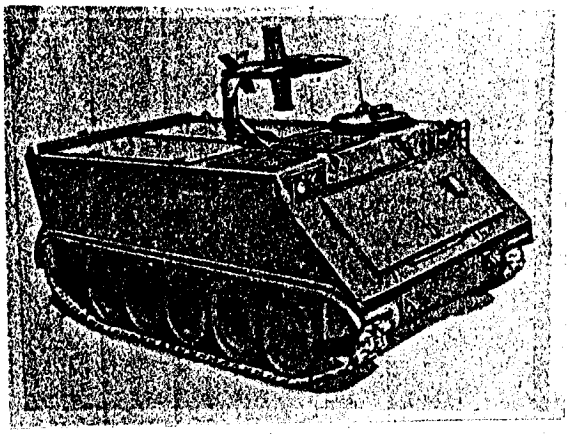

Illustration 1. Armored Personnel Carrier M113 (USA)

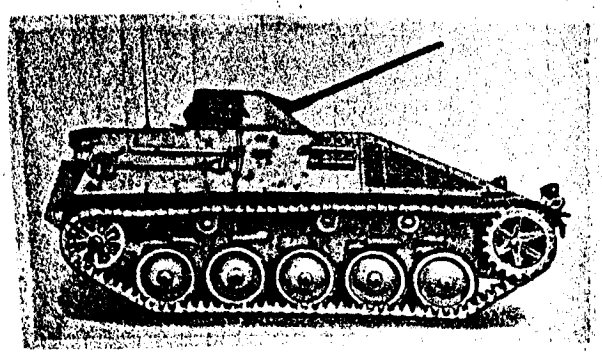

Illustration 2. Armored Personnel Carrier "Hotchkiss" (West Germany, France)

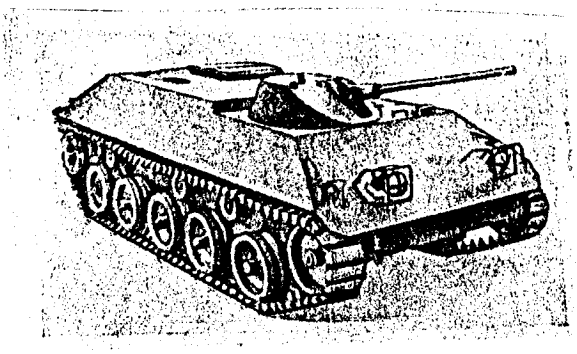

Illustration 3. Armored Personnel Carrier "Hispano-Suiza" (West Germany, Switzerland)

Artillery Combat Vehicles

Despite the presence of nuclear weapons, artillery support may be necessary for successful operations by tanks and infantry, especially when they are separated from the other forces. Therefore, it is desirable for the tank troops to have mobile tracked vehicles with light armor, equipped with howitzer or rocket armament (free rockets) and designated for artillery support of the tanks. Such vehicles should not be confused with the turretless tanks with shell-resistant armor, the so-called assault guns (SAU) of wartime. Artillery combat vehicles (ABM) usually carry out group fire from concealed positions at a definite distance from the enemy.

The ABM, in conformity with the missions it fulfils, must have shells that have good high-explosive fragmentation action, considerable range of fire, capable of destroying area targets, good lateral and range fire maneuverability, and, moreover, a large unit of fire. The most expedient armament is the howitzer (larger caliber than on tanks) or free rockets (multiple launching mount). It is recommended that only part of the vehicles be armed with the latter, as a supplement, capable of creating a high concentration of fire. Howitzer armament must be located in a closed revolving turret. Bulletproof armor giving protection from standard caliber automatic fire, is completely adequate - such vehicles avoid direct contact with the enemy.

The arrangement and chassis of the ABM should be the same as for a light tank, only having a different turret. For stability there should be a spade (soshnik) and suspension idler wheels. The questions of antiatomic protection should be resolved in the same manner as for other vehicles having light armament - light tanks and infantry combat vehicles.

The ABM has been developed to the greatest degree in the US Army where the artillery battalions of tank divisions are armed with 105mm and 155mm self-propelled howitzers. As an example of a vehicle of this type, Illustration 4 shows a T196 self-propelled howitzer of the American Army. Its weight is 18 tons. It is completely armored (bulletproof). The 155mm howitzer is mounted in a revolving turret. The range of fire is 16,000 meters, and the unit of fire is 50 rounds. The vehicle overcomes water barriers afloat, under its own power.

[redacted]

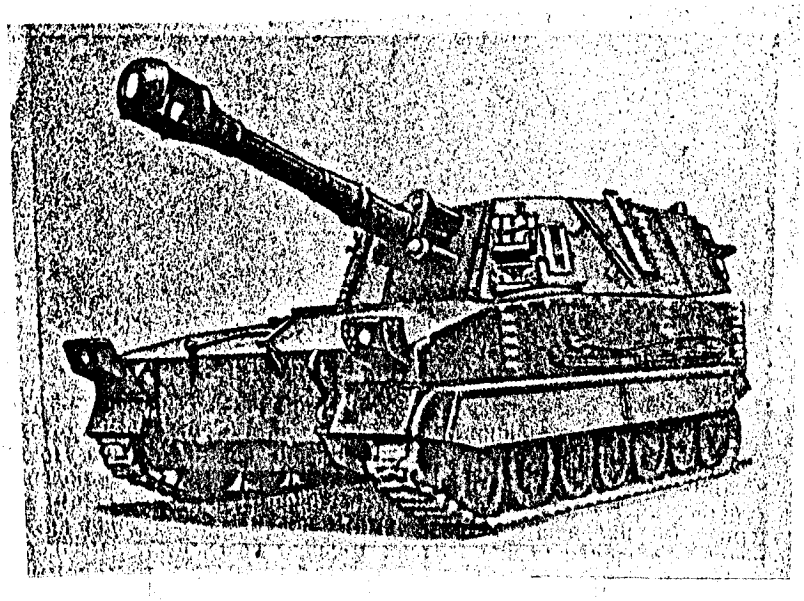

Illustration 4. 155mm T196 Self-Propelled Howitzer (USA)

Besides the field-type ABM used in the tank divisions for direct artillery support of tanks, it is now necessary to have high-powered ABMs. Such vehicles are intended for inflicting nuclear or conventional artillery strikes at distances of 20 to 30km. Their design can duplicate that of the field-type ABM in many ways (in an enlarged form) and can be made on the chassis of the basic tank. Either 150 - 175mm caliber guns or medium-caliber free rockets (missiles) may serve as armament. A vehicle of this type is shown in Illustration 5. This is the 175mm T235 atomic assault gun of the US Army. Its weight is 26 tons, and range of fire is 30,000 meters. The mechanic-driver is located in an armored cab. The crew and an additional unit of fire are located in an auxiliary armored personnel carrier. The vehicle has quite a large cruising range (800 km).

High-powered ABM's may be attached to tank divisions or even included in their composition.

50X1-HUM

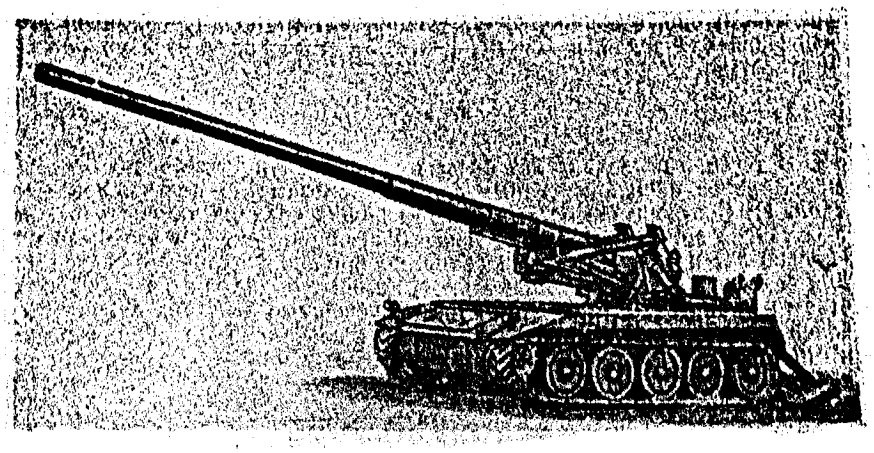

Illustration 5. 175mm T235 Atomic Assault Gun (USA)

Vehicle on an "Air Cushion"

Let us evaluate the prospects of military application of vehicles flying slightly above the surface of the ground by using supporting ("air cushion") running gear. In order to have such a vehicle travel above the surface of the ground and above water, the pressures exerted at its base are limited by values of approximately 50 to 100 kg/m^2. This means that a vehicle that weighs approximately 10 tons must have, with a fairly small expenditure of force, a base area of more than 100 square meters. The uppermost limit of the above-indicated pressure is applicable for some planned vehicles of greater weight, and the lowest has been implemented in various types of flying motor vehicles and in the British vehicle "Hovercraft".

The large length and width, with a comparatively small lift height (not over 0.4 meters) and the small size of slope negotiated (from 8 to 13° in prototypes) limit the possibilities of wide-scale application of such vehicles for military purposes, permitting them to move only over roads, unusually level terrain, and over calm water surfaces.

50X1-HUM

The advantages of utilizing supporting running gear consist of the fact that in comparison with the engines of aircraft (helicopters) it permits reducing the power from approximately 200 HP/ton to 80 to 100 HP/ton. Moreover, according to data in the foreign press, the useful load may reach 40 percent of the weight of the vehicle.

If we limit ourselves to a small clearance (of up to 0.4m), then the basic faults of a vehicle with supporting running gear will be: complexity of design, connected with ensuring control during movement, large size, and limited cross-country ability when moving over uneven terrain. If their clearance is increased, then the power necessary to lift it will grow rapidly and will attain values that modern aircraft have. The power limitations are approximately the same for "flying jeeps" that have ducted rotors. With an increase of the clearance, the load capacity decreases sharply, the expenditure of fuel increases, and the cruising range is reduced.

Taking into consideration everything that has been stated, it is possible to visualize two types of such combat vehicles:

-- small vehicles, intended for movement above land and water, which will be ground troop equipment; their intended combat use will be reconnaissance and communications; increasing the clearance will lead to unfavorable parameters of the unit power rating which, however, may prove necessary; therefore we do not rule out the possibility of utilizing a vehicle of the "flying jeep" type with ducted rotors;

-- fairly large vehicles that are a means of transport, obviously they will be used to advantage for moving over water, but also will be able to move over fairly level terrain.

* * * *

During the last few years, the combat characteristics and, above all, the firepower of the tanks of our probable enemies have increased significantly (see Table 1). The correlation of the combat qualities of our medium tanks and the basic tanks of the US Army has become less favorable than it was several years ago. Therefore, it is necessary to apply serious efforts to creating new models of tanks that would be superior to the foreign ones. It is also clear that successful ground troop operations are possible only if they are equipped, not only with high-quality tanks, but also with a number of other combat vehicles that answer modern requirements.