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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

7 April 1975

MEMORANDUM FOR: The Director of Central Intelligence
SUBJECT : MILITARY THOUGHT (USSR): The Air Defense of a Tank Army in Operations Separated from the Other Front Forces

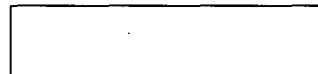
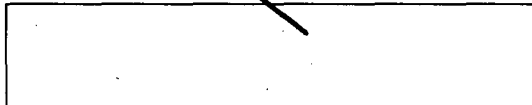
1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought". This article deals with the requirements placed on an air defense system, and with the composition and tasks of air defense troops in a tank army. Two charts are provided to illustrate the firepower and density of fire of air defense means in different situations. The author offers examples of possible improvements in air defense systems used specifically for protection of tank formations. This article appeared in Issue No. 2 (87) for 1969.

2. Because the source of this report is extremely sensitive, this document should be handled on a strict need-to-know basis within recipient agencies. For ease of reference, reports from this publication have been assigned

William F. Nelson
Deputy Director for Operations

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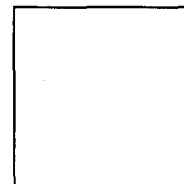
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Intelligence Information Special Report

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COUNTRY USSR

DATE OF
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SUBJECT

MILITARY THOUGHT (USSR): The Air Defense of a Tank Army in Operations Separated from the Other Front Forces

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 2 (87) for 1969 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought". The author of this article is Colonel V. Spasov. This article deals with the requirements placed on an air defense system, and with the composition and tasks of air defense troops in a tank army. Two charts are provided to illustrate the firepower and density of fire of air defense means in different situations. The author offers examples of possible improvements in air defense systems used specifically for protection of tank formations.

End of Summary

Comment:

There is no information in available reference materials which can be firmly associated with the author. The SECRET version of Military Thought was published three times annually and was distributed down to the level of division commander. It reportedly ceased publication at the end of 1970.

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The Air Defense of a Tank Army in Operations
Separated from the Other Front Forces

by
Colonel V. Spasov
Doctor of Military Sciences

The destruction by fire of enemy missile/nuclear means and main reserves on the axis of operations of a tank army is accepted as the decisive condition for achieving the goal of an operation. Not to belittle the importance of combat with enemy missile/nuclear weapons and reserves opposing a tank army while it is carrying out a deep strike, we think air strikes also represent a serious danger to it.

This is due, on the one hand, to the very substantial air forces of the probable enemy and, on the other hand, to the great maneuverability of these forces, not only in the zone of an army group but also within the boundaries of a theater of war, for the purpose of concentrating the principal effort on the main axes of advance of our troops.

The possible composition of enemy air forces assigned to actions against a tank army will depend upon the axis on which the army is advancing; the level of aircraft losses and their replenishment from other theaters, from the continental United States, and from the national air forces of the aggressive bloc member-countries; and also upon the possibilities of assigning carrier-based aircraft.

Let us examine the method of calculating the composition of the forces mentioned (for the Central European Theater of Military Operations), when a tank army is advancing in the zone of operations of the Central Army Group supported by the 4th Allied Tactical Air Force (reinforced by 200 to 300 aircraft from the continental United States).

Allowing up to 50 percent overall aircraft losses, the strength of the 4th Allied Tactical Air Force can reach 600 aircraft (not counting the all-weather fighters of the air defense system). It also is entirely possible that up to 100 aircraft of carrier aviation of the US Atlantic Fleet may be assigned to the Central Army Group zone. Thus (assuming the

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combat readiness is 70 to 75 percent), a total of approximately 500 aircraft can operate in the Central Army Group zone. The enemy supposedly will assign up to 40 percent of his combat-ready forces, i.e., up to 200 aircraft, to the axis of operations of a tank army. Under these conditions, but with 70 percent aircraft losses by the 4th Allied Tactical Air Force, up to 150 aircraft (up to half of these with nuclear bombs) can deliver strikes against the army troops and objectives.

It is important to note that, as the tank army exploits the success and becomes separated from other front forces, the relative proportion of air strikes against it may increase because of the lowered intensity of air activity on other axes. In an attempt to destroy the main tank army grouping, the enemy will be forced to employ aviation as his immediate (according to the time of commitment to action) operational-strategic reserve.

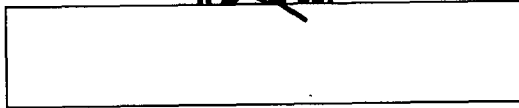
The considerations set forth are the basis for the conclusion that continuous and successful combat with the air enemy to prevent or break up his strikes against the tank army is an important condition of success in actions of an army separated from other front forces.

The development of enemy tactical and carrier-based aviation, as well as the methods of their employment, is proceeding, as is known, along the lines of intensive adaptation to the conditions of modern operations in ground theaters of military operations. Massing and surprise are acquiring special significance in the enemy use of the means of air attack (as confirmed in the Vietnam and Near East wars).

We will note first of all that the delivery of massive and concentrated strikes against the main strike grouping of advancing troops, especially against tank large units, will be characterized by the decisiveness of goals, the participation of considerable forces in the strikes, and a strongly pronounced irregularity in the formation of these forces in space.

Attempts to substantially reduce losses from air defense means and to prevent the breakup of massive and concentrated air strikes will take the form of active countermeasures against the tank army air defense system, low altitude flights, the use of high densities of aircraft in attacks, and the overcoming of the fire plan of antiaircraft means on individual (narrow along the front) axes.

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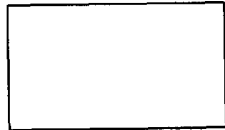
The achievement of surprise in strikes will be facilitated by the relatively short (up to 100 kilometers and less) distance of enemy aviation bases, the complexity and uncertainty of the situation as a whole, and a reduction in radar reconnaissance capabilities. It is not ruled out that, under conditions of the use of only conventional weapons, the enemy will attempt to initiate nuclear actions at the moment the tank army is separated from the other front forces and, in the first massive nuclear strike, inflict serious damage on it.

Typical of the problems involved in the fulfilment of tasks by the air defense troops of a tank army are the lack of coordination with air defense troops of adjacent formations and the limited amount of front air defense means brought in for its support; the difficulties of implementing reconnaissance of the air enemy and his great capabilities for achieving surprise in the delivery of strikes against army troops; the complexity of effecting the timely resupply of materiel and technical equipment, particularly ammunition; and the limited capabilities for centralized fire control of air defense means.

The most important requirements of an air defense system are: a high and continual readiness to repel surprise air strikes against army troops during their actions in combat and march formations; the capacity independently, and with limited forces, to repel high-density attacks; the capability for a broad fire maneuver by altitude and direction for the purpose of concentrating the main efforts to destroy the main enemy grouping in the air; and the viability of air defense means and systems, especially against the effects of weapons of mass destruction.

The most complicated task is that of stopping massive and concentrated nuclear strikes by the air enemy. Therefore, the capabilities of the tank army air defense means should be evaluated namely in the interests of accomplishing this very task, since its accomplishment ensures the success of all the other tasks.

The composition of the air defense troops of a tank army can consist of: a medium-range surface-to-air missile brigade; an antiaircraft artillery regiment, and a separate air defense radiotechnical battalion subordinate to an army; and short-range surface-to-air missile regiments of tank divisions, and antiaircraft artillery battalions or antiaircraft missile-artillery batteries (a platoon of ZSU-23-4, and a surface-to-air missile platoon) of tank (motorized rifle) regiments. In addition, tank and motorized rifle subunits are armed with portable surface-to-air missile systems.



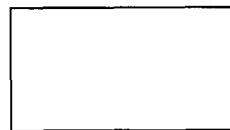


The firepower of these means in combat with tactical aviation (for one firing) is shown in Chart 1.

Chart 1*

Portion of means changing positions	Air defense means	Percentage of losses		
		0	30	50
0	Army and division	13-22	9-15	7-11
	Regiment	12	9	6
	Total	25-34	18-24	13-17
1/3	Army and division	8-14	5-9	4-7
	Regiment	12	9	6
	Total	20-26	14-18	10-13
1/2	Army and division	6-10	4-6	3-5
	Regiment	12	9	6
	Total	18-22	13-15	9-11

*The calculations were derived by a simplified method and without taking into consideration portable surface-to-air missile systems, depending on the level of losses and the size of the coefficient of displacement of all air defense means which cannot fire while in motion.



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This chart shows the magnitude of the mathematical expectation of the number of destroyed enemy aircraft (the lower limit is under conditions of intensive radio jamming by the enemy).

As can be seen from the chart, losses and displacement of air defense troops during combat (from 1/3 to 1/2 the complement of army and division air defense means) can reduce their firepower by two to three times.

It is appropriate to note here that there is a drop in the relative proportion of enemy losses from one firing of air defense means of army and division subordination as the number of units (subunits) being displaced increases, while there is an increase from the fire of regimental antiaircraft means.

The firepower of tank army air defense troops repelling a massive or concentrated air strike depends directly and above all on the number of fire cycles which can be carried out by the participating air defense means, and on the specific variant of the strike formation.

If (as a variant), while repelling a massive strike, three or four fire cycles are conducted by the antiaircraft means of army and division subordination and four or five by regimental antiaircraft means, the enemy losses in this attack may be 70 to 80 aircraft. However, the execution of massive air strikes against tank army troops is sufficiently complicated because of the uneven advance by the tank divisions operating on various axes, and by the limited time available for organizing such strikes. Instead, the enemy may consecutively deliver several concentrated strikes each against one or two divisions (with the participation of several dozens of aircraft).

Calculations show that in repelling, for example, concentrated strikes by a total strength of 50 aircraft against two tank divisions of the first echelon, enemy losses from one or two fire cycles by division air defense means or two or three fire cycles by regimental means (with the assignment to a given axis of one separate surface-to-air missile battalion of a brigade) will consist of 25 to 30 aircraft.

Under the conditions examined, the reliability of tank army air defense will be 50 to 70 percent, which cannot be considered sufficient in the event of the use (or threatened use) of nuclear weapons. It may be increased by calling on front fighter aviation (which will require using up to half the aircraft resources of front fighter aviation). The latter will become possible only if part of the fighter aviation is redeployed to

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airfields as close as possible to the army zone of operations. The capture and preparation of such airfields by a tank army must be given serious consideration. For this purpose a tank army requires reinforcement by a minimum of one medium or short-range surface-to-air missile regiment to provide cover for the army rocket brigade. And in the event of significant air defense troop losses at the moment of separation, more powerful reinforcement by front air defense means will be required.

An important method of increasing the firepower of tank army air defense troops is to increase the expenditure rate of surface-to-air missiles, which undoubtedly must be provided for beforehand and ensured by timely delivery from front bases by air transport.

The effectiveness of repelling high-density attacks (up to 20 to 30 aircraft per minute), as is known, is ensured by the capability of simultaneously employing a sufficiently large number of target channels of active air defense means and inflicting the required destruction on the enemy in a unit of time. This important capacity of a tank army air defense system may be evaluated by relating the density of fire to the density of aircraft during an attack (in an attack by waves, without calculating the intervals between them). The density of fire* essentially depends upon the altitude range, as indicated in Chart 2.

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*By density of fire is understood the number of equally effective target channels which can be used in a unit of time.

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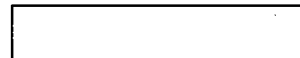
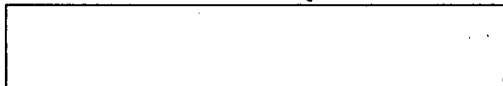


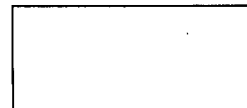
Chart 2*

Altitude range, in kilometers	Density of fire (number of target channels per minute)	Relative proportion in the fire plan, percentage
0.25-1.5	23-24	100
1.5-3.0	13-14	50
3.0-8.0	8	33
Higher than 8	1.5	7

As indicated in the chart, the density of fire falls with an increase of altitudes of the strikes being repelled. Thus, it drops twice as much at altitudes of 1.5 to 3.0 kilometers, and three times as much at an altitude range of 3 to 8 kilometers, than at altitudes of 0.25 to 1.5 kilometers. A sharp drop in density occurs at altitudes of 8 kilometers. Meanwhile, strikes against a rocket brigade and tank troops (especially with nuclear bombs) from altitudes of 3 to 10 kilometers may be highly effective. Therefore, the existing distribution of density of fire according to altitudes cannot be considered the optimum one.

Furthermore, this capacity of an air defense system is related to the capabilities of fire maneuver by direction. On an army scale, these capabilities are limited by the forces of the surface-to-air missile brigade, each surface-to-air missile system of which can maneuver by fire in a zone of up to 60 kilometers. To put it another way, not infrequently it may be possible to employ only one surface-to-air missile battalion of this brigade to repel the strike of the main forces of enemy aviation in the narrow, along the front, axis that he has selected. Therefore, the grouping of the brigade should be more compact, so that all brigade target channels, or a large part of them, may be used for the destruction of the main enemy aviation grouping regardless of the direction from which the strike may come.

*Calculations were made for conditions when losses of air defense troops reach 1/3 of their complement, and 50 percent of the surface-to-air missile systems of army and division subordination are changing positions.



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A tank army operating while separated may carry out the most diverse tasks (engage in battle with enemy reserves, break through defensive lines, force water obstacles, etc.). However, irrespective of the specific conditions of a situation, the primary objectives of air defense protection will be: for a surface-to-air missile brigade, the main army grouping; for short-range surface-to-air missile regiments, the main tank division groupings; and for a surface-to-air missile battery (antiaircraft artillery battalion), the main groupings of tank (motorized rifle) regiments.

During the advance of a tank army to meet the approaching enemy reserves, its air defense troops follow in the march formations of large units and units in readiness to repel air strikes; or after deployment into combat formations (army and division means) or in movement and in short halts (regimental antiaircraft means).

The main forces of an army surface-to-air missile brigade may move forward at the same pace as the main forces of the first-echelon divisions, usually along two routes. If the army is not reinforced by some type of air defense means (for example, by a surface-to-air missile regiment), then part of the surface-to-air missile brigade forces (one surface-to-air missile battalion) must be moved forward together with the army operational-tactical rocket brigade.

The surface-to-air missile regiments of the first-echelon divisions usually move along two routes each -- either at the head of the main forces (compactly by groups of batteries), or in the columns of the main forces (by battery at interval distances of 5 to 15 kilometers). The second variant essentially is the regiment approach march formation, and ensures the deployment of all batteries in no more than 10 minutes from the moment the signal is received, since in this case practically no additional time is required for moving into the areas of the launching (firing) sites.

In a massive or concentrated strike by the air enemy, the surface-to-air missile regiments of the tank divisions (and if necessary, also the units of the surface-to-air missile brigade) are deployed into combat formations and repel the attack together with regimental antiaircraft means and fighter aviation. After the conclusion of the attack these units reform and continue to move along their assigned axes. Until their approach, cover for the first-echelon large units is provided by regimental antiaircraft means.

The deployment of first-echelon divisions to conduct meeting battles, as is known, may be accomplished either simultaneously (on one general line

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for army troops), or consecutively (on lines varying in depth and axis). In the first case, the surface-to-air missile brigade deploys all its forces simultaneously, in an attempt to provide the densest fire to cover the main grouping of the army first echelon. In the second case, its deployment into combat formation may be effected consecutively (by units) according to the order of priority of the tank division entry into battle.

The interval distances between separate surface-to-air missile battalions (when the K-1 automated control system is used for fire control of the brigade) must be no more than 40 kilometers. Depending on the directions of attack, the surface-to-air missile brigade may cover with its kill zone an army troop combat operations area on a 70- to 100-kilometer front. Each separate surface-to-air missile battalion of the brigade is deployed in combat formation in an area with a radius of up to five kilometers. The distance of the brigade technical battery from the launch site must be within 30 kilometers.

In those instances when a tank army is reinforced by one surface-to-air missile regiment, this regiment is used for air defense of the rocket brigade and other important targets located in this area (for example, an army mobile missile-technical base and an army surface-to-air missile technical base).

If it is necessary to organize cover for two tank army groupings (the troops advancing toward the enemy main forces, and the troops of the army main forces which will conduct a flanking maneuver to strike the enemy flank), it is desirable to use a surface-to-air missile brigade to cover the troops making the maneuver. Fighter aviation also should be assigned to accomplish the first task.

If the tank army attacks with the objective of splitting and destroying the enemy, the surface-to-air missile brigade deploys to cover the main grouping of the army first echelon, subsequently shifting position to the axis of attack of one or two divisions. Such use of all brigade forces allows one or two battalions to provide uninterrupted fire coverage of the divisions carrying out the most important task, which is particularly necessary during the threat of strikes from any direction. However, such a variant is possible only by the reinforcement of the army by at least one surface-to-air missile regiment (to cover the army operational-tactical rocket brigade).

The lack of adjacent friendly troops, the threat of attacks from any direction, and significant losses of air defense troops -- all this

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objectively heightens the role of fighter aviation in the tank army air defense system. The distribution of efforts of fighter aviation and of the army air defense troops when repelling strikes is accomplished basically by zones and within one zone (by axes, altitudes, and time). It should be taken into account that the antiaircraft means of tank (motorized rifle) regiments do not have IPF system interrogators. Therefore, to avoid accidental losses, it is usually recommended that fighter aircraft not enter the zone of fire of these regiments.

For the practical resolution of the numerous and complicated problems of coordinating surface-to-air missile systems with fighter aviation, the command post of the tank army air defense troop commander must have an authorized representative of fighter aviation with a group of navigators, and with communications and control means. The colocation of the fighter aviation control posts with the command posts of antiaircraft large units and units will also play a positive role. However, this is feasible only under conditions of sharply increased mobility of radiotechnical control means.

The combat actions of the tank army air defense forces, especially of fighter aviation, must be supported by continuous reconnaissance of the air enemy. However, actions on individual axes, the sequence of swift assaults at a great depth with the rapid deployment of part of the forces or of the main forces of the tank army to destroy the enemy, and the necessity for crossing zones with high levels of radiation -- all this practically rules out not only the continuous functioning of complete radar coverage, but also the possibility of conducting continuous radar reconnaissance by army and division means in general. Therefore, part of the radar reconnaissance forces and means must be deployed even before the tank army troops arrive at the lines of contact with the enemy. Radar posts equipped with radar sets on self-propelled bases, can advance together with the forward detachments of the first-echelon divisions in readiness to deploy upon command from the army air defense command post.

Under conditions wherein it does not appear possible to establish complete radar coverage in the army zone, the radar coverage is coordinated on the most important axes and by calling upon the army and division reconnaissance means. As a whole, the problem of the capabilities of radar reconnaissance of the air enemy in support of the combat actions of our active air defense means, and of the forces necessary for its organization, is very complicated and requires special examination. To solve this problem, as the experience of a number of exercises has shown, along with the above measures, it is necessary to speed up the re-equipment of army and

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division radar reconnaissance means with more mobile general-purpose radar sets, and also to assign to the army a separate radar regiment consisting of no less than six radar companies.

When a tank army is forcing a water obstacle, the most intensive action by the air enemy will be against the divisions which are the first to arrive at the river; and during the actual forcing of the water obstacle it will be the main crossings and those troops having the greatest success who will be subjected to intensive action.

In a situation when the army first-echelon divisions begin crossing the river practically simultaneously, the surface-to-air missile brigade grouping, as well as the surface-to-air missile regiments of the division located on the starting bank and making the crossing, form up according to a single plan to ensure that enemy air strikes from any direction are most effectively repelled. For the simultaneous coverage of objectives located at considerable distances from one another (first-echelon troops exploiting success on the opposite bank, the second echelons and the army rocket brigade operating on the starting bank, as well as the crossings), maximum use will have to be made of front fighter aviation along with the army air defense troops. This may be particularly necessary to repulse enemy strikes against the main army forces moving out toward the water obstacle (before the deployment on its own side of the main forces of the air defense troops of division and army subordination).

The crossing by army troops of radioactive contamination zones covering the approaches to the enemy lines of defense also will involve repelling intensive air strikes. The enemy will strive to inflict destruction on the massing of tank army troops in front of the zone (with a nuclear mine belt), as well as within the zone. This necessitates deploying the main forces of the surface-to-air missile brigade in front of the contamination zone to cover the first-echelon divisions while they are crossing (in the entire depth). When forming the surface-to-air missile system grouping, the axes on which the troops will cross the zone must be taken into account.

The sequence for shifting air defense troops during the crossing of a contamination zone is determined first by the degree of protection the systems and the means of transportation have. If radiation levels permit, it is desirable for divisional and regimental air defense means to cross the zone at the same time as the tank subunits and units.

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In determining the method and time for the air defense means to start crossing zones of radioactive contamination, it is necessary to take into consideration that the surface-to-air missile systems and the ZSU-23-4 afford crews good protection from the casualty-producing elements of nuclear bursts. However, their shielding capability against radiation is three to four times less than that of tanks.

These zones are an especially effective barrier to radar sets whose protective properties are six to eight times lower than those of tanks. In view of this, it is obviously necessary to develop measures for increasing the protective properties of systems (from radioactive contamination) and to replace P-15 and P-10 (P-12) radars with track-mounted radars. The command posts of anti-aircraft large units and units should be equipped with vehicles which afford protection against weapons of mass destruction at least as good as that of the rest of the elements of surface-to-air systems. In the future, the combat crews and air defense means of the tank troops must be protected, in principle, from weapons of mass destruction the same as tank crews. Therefore, it is desirable to mount all tank army air defense means on the same type of running base as tanks, with an equal range and speed of movement.

The experience of exercises confirms that the tank army air defense system, based on the use of new organic and attached air defense means, can, in coordination with fighter aviation, ensure the fulfillment of its assigned tasks to a considerable degree. However, the inherent characteristics of the combat actions of tank troops separated from the other front forces require further improvement in the air defense systems and means of tank formations and large units.

One possible course for the development of these means may be to increase the size of the kill zone of medium and short-range surface-to-air missile systems, and to increase their multichannel target capability. Thus, surface-to-air missile systems with a kill zone of up to a radius of 80 kilometers can maneuver by fire throughout the army zone (or at least in the zone of operations of its main grouping); and the availability of several target channels allows the density of fire at altitudes from 3 to 8 kilometers and higher to be significantly increased (see Chart 2). Such a course is most logical, and thus desirable. The fact is that there must be a direct relationship between the size of the kill zone of a system and the number of its target channels: the larger the kill zone, the more targets it can contain simultaneously, and, therefore, the greater the density of fire must be in this zone. From an economics point of view (for the type of surface-to-air missile systems being examined) it is more advantageous

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to raise the density of fire, not by increasing the number of systems, but by increasing the number of target channels of each of them.

Along with this, the maneuverability of army and division types of surface-to-air missile systems should be improved: by shortening the time required to bring them to a firing position; and by increasing their speed of movement.

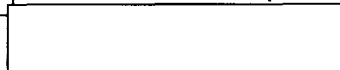
The solution to the problem of reconnoitering the air enemy, which is the weakest point in the tank army air defense system, may be effected, in particular, by introducing into the armament helicopter-borne radar sets with a greater detection zone against low-flying targets than ground radars have. Furthermore, in contrast to the air defense system of combined-arms armies, where the basic method of solving reconnaissance problems up till now usually involved setting up complete radar coverage, under conditions of conducting tank army operations (especially in actions in which they are separated), the solution should be oriented toward establishing complete reconnaissance zones only on the most important axes. In view of this, there is an increase in the role of the division level of the system of reconnaissance of the air enemy.

The importance of the tasks being carried out by a tank army, and the special features of organizing its air defense, necessitate having an army surface-to-air missile brigade of four divisions as well as an army short-range surface-to-air missile regiment. This allows the simultaneous coverage of first-echelon troops and the army rocket brigade, whose distance from the first-echelon divisions, as a rule, will be considerably greater than in combined-arms armies.

An important way of further improving the tank army air defense system is to reduce the sum total of types of air defense means at the tactical level. This is dictated as much by economic considerations as by the interests of fire control of air defense troops. Serious consideration must be given to the direct defense and protection from enemy ground forces of surface-to-air missile units and large units, which often move in independent columns. Their complement should contain subunits capable of destroying the ground enemy and, at the same time, combatting the air enemy at low and very low altitudes (whose strikes represent a great danger to the columns and launching sites of surface-to-air missile systems).

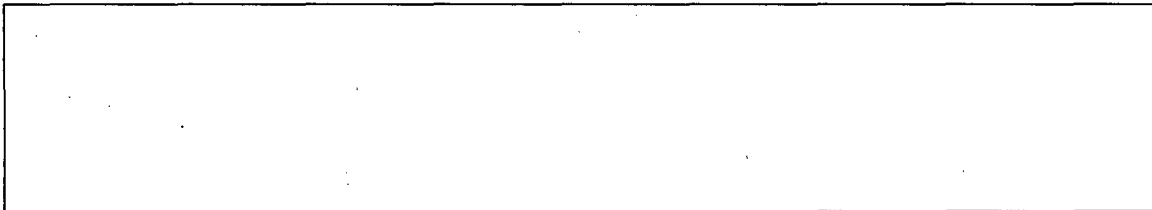
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In conclusion, it should be noted that among the important methods of combat with the air enemy are the delivery of strikes on his aviation basing airfields by the army rocket brigade forces, and the capture of enemy tactical aviation airfields by tank units and airborne landing forces. All this may considerably weaken the enemy aviation grouping and seriously lower the effectiveness of its pressure on the tank army forces.



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