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CENTRAL INTELLIGENCE AGENCY
WASHINGTON 25, D.C.

30 AUG 1951

MEMORANDUM FOR: Assistant to the Secretary of Defense
(Special Operations)

SUBJECT : "Anti-Missile Defense of Troops of a Front"
by Lt. Gen. V. Mikhaylov

1. Enclosed is a verbatim translation of an article entitled "Anti-Missile Defense of Troops of a Front" by Lt. Gen. V. Mikhaylov which appeared in a special TOP SECRET issue of the Soviet military journal Voyennaya Mysl (Military Thought).

2. This article was acquired by a Soviet official who has provided reliable information in the past.

FOR THE DEPUTY DIRECTOR, PLANS:

Richard Helms

RICHARD HELMS

Enclosure

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cc: Military Representative of the President

Special Assistant to the President for
National Security Affairs

Director for Intelligence
The Joint Staff

Assistant Chief of Staff, Intelligence
Headquarters, U. S. Air Force

Assistant Chief of Staff for Intelligence
Department of the Army

Director of Naval Intelligence
Department of the Navy

Director, National Security Agency

The Director of Intelligence and Research
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Chairman, Guided Missiles and Astronautics
Intelligence Committee

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Assistant Director for National Estimates

Assistant Director for Current Intelligence

Assistant Director for Scientific Intelligence

Assistant Director for Research and Reports

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COUNTRY : USSR

SUBJECT [redacted] "Anti-Missile Defense of Troops of a Front", by Lt. Gen. V. Mikhaylov

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Following is a verbatim translation of an article entitled "Anti-Missile Defense of Troops of a Front", written by Lt. Gen. V. Mikhaylov.

This article appeared in the 1961 Second Edition of a special version of Voyennaya Mysl (Military Thought) which is classified TOP SECRET and is issued irregularly. According to the preface, this edition contains articles never before published and some speeches which have been delivered prior to being published in this form. It is distributed only within the Ministry of Defense down to the level of Army Commander.

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Anti-Missile Defense of Troops of a Front

by

Lt. Gen. V. Mikhaylov

It is known that at the present time our potential enemies consider missiles as the basic means of delivering nuclear charges to targets. In recent years appropriations in the USA for work in the field of missile technology have increased by fivefold. The success of operations conducted by our front operational groupings (obedineniye) will depend to a significant degree on the number of available means for combating enemy nuclear weapons delivery vehicles, including ballistic missiles.

Combat against ballistic missiles is conducted on the ground and in the air. This article will not take up combat against missiles on the ground. The purpose of this article is to examine the characteristics of ballistic missiles as air targets and to indicate methods of creating appropriate armament and military equipment, and to present a number of principles of organization of anti-missile defense in front operations. In this regard, it is to be borne in mind that initially anti-missile weapons will supplement the existing PVO system of the front; subsequently, depending on the extent to which the potential enemy increases his use of ballistic missiles in operations, it will become necessary to create a system of anti-missile defense which is supplemented by the weapons for combat against piloted aircraft.

As is known, the term ballistic missile is given to a flying object which is controlled only in the initial sector of the trajectory (up to 10 percent of D), which has the appearance of a ballistic curve. Ballistic missiles possess supersonic speeds, various ranges, high trajectories, and different weights of warheads (boyevaya chast). This permits them to be used in strikes against objectives at tactical, operational, and strategic depths. Missiles can carry nuclear charges of different magnitudes (in TNT equivalents of from several thousand to several million tons).

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It should be assumed that operational - tactical designation ballistic missiles can be used against troops and objectives in the front zone. The use of strategic-designation missiles in the front zone can be expected when objectives of a strategic nature are deployed at operational depth or when the conditions of the situation compel the enemy to carry out strikes with these missiles against front targets.

Combat against ballistic missiles can be carried out in the areas of their launch, in the flight trajectory, and also in the sector of their stabilization on entering the dense layers of the atmosphere. Success in combatting ballistic missiles will depend on the tactical-technical data of the anti-missile defense weapons, the system of anti-missile defense created, and the quality of the automated system of control of the anti-missile weapons.

It is known that the employment of means of air attack by the enemy, including ballistic missiles, will be influenced by: the stage of the war, the importance of the theater of combat operations, the enemy capability to use missiles, and the nature of the operations being conducted by the front in a given theater of combat operations.

We shall try to examine, by a concrete example, the quantity and types of missiles the enemy can be expected to use in a front offensive operation in the Western TVD /teatr voyennykh deystviy - theater of combat/.

Let us assume that opposing the front is a group of armies comprising two field armies and a tactical air army. Each field army is reinforced with one group of the URS /upravlyayemyy reaktivnyy snaryad - guided missile/ "Redstone", two to three battalions (divizion) of the URS "Corporal", and six to nine battalions of "Honest John". In the interest of defensive operations for the group of armies one squadron (eskadrilya) of "Thor" missiles carries out one launching by all its installations (ustanovka). Let us also assume that the missile weapons of neighboring field armies are not called upon in the strike against the troops and objectives in the front which we are studying. In this situation the following quantity of ballistic missiles can be employed by the enemy in the front offensive zone (Table 1).

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Table 1

Type of Missile	Number of Sub-Units	Number of Launch Sites per Battery, per Battalion	Number of Missiles in One Launching	Time Required for Reload
Redstone	4 batteries	1	4	5-8 hours
Corporal	4 battalions	2	8	4-6 hours
Honest John	12 battalions reinforced	4	48	0.5-1 hour
	8 mixed battalions from divisions of the first echelon	2	16	up to 3-4 hours
Thor	1 squadron	15	15	8-10 hours
TOTAL			91 missiles	

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As can be seen from the table, 91 missiles can be fired simultaneously, of which up to 76 are operational-tactical and up to 15 missiles are of strategic designation. The second firing of ballistic missiles is possible after 3-8 hours, taking into consideration the need to prepare the next firing, to define the targets better, and to change the launching sites (startovaya pozitsiya) for the operational-tactical missiles.

In the event of missile firing at irregular intervals (deliberate firing), which can take place in an operation conducted in a subsequent stage of the war, the number of missiles in a front zone that can be fired in a 24-hour period is only 30-45, of which 25-40 will be directed against objectives in the tactical depth.

Considering the limited number of ballistic missiles at the disposal of a group of armies, it is possible to assume that the strikes of the operational-tactical missiles will be directed against the main formations of front troops, assembly bases for nuclear and missile weapons, and missile large unit and unit positions, control centers, airfields where the frontal air support is based, main railroad junctions, and crossings; the strikes of strategic designation missiles will be directed against the most important rear-area objectives of the front. Strikes by ballistic missiles will be made in conjunction with sorties of piloted aircraft, the launching of balloons, and strikes by winged missiles.

In a defensive operation, the front can repel an attack of a group of armies made up of three field armies and a tactical air army, reinforced with a large quantity of missiles for use in offensive actions. In the zone of defense of a front, as an alternate, the enemy may employ the following number of ballistic missiles (Table 2).

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Table 2

Type of Missile	Number of Sub-Units	Number of Launch Sites per Battery (Battalion)	Number of Missiles in One Launching	Time Required for Reload
Redstone	4 batteries	1	4	5-8 hours
Corporal	6 battalions	2	12	4-6 hours
Honest John	18 battalions reinforced	4	72	from 0.5-one hour
	12 mixed battalions from divisions of the first echelon	2	24	up to 3-4 hours
Total			112 Missiles	

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We can see that in a defensive operation a front can expect a greater number of missiles to be launched simultaneously by the enemy than in an offensive operation. The use of nuclear warheads (yadernyye boyepripasy) in all missiles makes it possible to knock out 112 objectives in the defense zone of the front in one launching, 96 of these being within the limits of the tactical zone. Such a strike, naturally, can sharply reduce the defensive stability of the troops, especially in the tactical depth.

In the case of deliberate missile firing, 35 to 55 missiles can be expected in a 24-hour period, of which 30 to 50 will be directed against the most important objectives in the tactical depth of the defense.

The means for anti-missile warfare must be capable of destroying both ballistic missiles with a relatively short range (up to 30 km) and ballistic missiles with a range of from 160 - 300 up to 3,000 km. It is necessary to take into consideration the fact that the short-range missiles will comprise up to 70 percent of all the missiles the enemy will use in the frontal zone.

It is known that the existing PVO means of a front do not have the tactical-technical characteristics to cope with the ballistic missiles of the potential enemies. A radical change is needed in these weapons, especially in the surface-to-air (zenitnaya) guided missiles.

Combat against ballistic missiles in the air requires: an increase in the distance and altitude at which the missile can be detected and tracked by radar; the creation of a guidance system for anti-missiles (sistema navedeniya antiraket), combined with a system of long-range reconnaissance of enemy ballistic missiles and with a system for automatically computing the required data, to insure the interception of enemy ballistic missiles at specified distances and altitudes; the creation of anti-missiles which possess appropriate tactical-technical characteristics; the development of new radiotechnical sets (stantsiya) to jam the guidance and the homing systems (apparatura samonavedeniya) of the ballistic missiles of the enemy.

The combat employment of all these means will be more effective upon the creation of an automated guidance system

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(avtomatizirovannaya sistema upravleniya) which is based on electronic computing machines (elektronno-vychislitelnaya mashina) and which insures the continuous automatic evaluation of the air situation and the working out of the problem of committing appropriate forces and means of anti-missile combat.

Thus, we view anti-missile combat as a complex system of measures which includes the reconnaissance and assured tracking of ballistic missiles in the air; the automatic computation of the necessary data which will insure the interception of ballistic missiles in the air at specified parameters of the objectives (areas) being covered; the launching of anti-missiles in order to destroy the enemy missiles in the air; radio countermeasures (radioprotivodeystviye) assuring the generation of jamming of the missile guidance system and their homing devices.

In order to effect the timely detection and tracking of ballistic missiles, radar reconnaissance must insure a detection range of not less than 250-500 km in combat with missiles of operational-tactical designation and 2,000 - 2,500 km in combat with missiles of strategic designation.

From the point of view of anti-missile combat, the detection range for missiles should exceed, or at least be equal to, the missile range. However, it is known that any radar station acts only in the limits of direct line of sight. The maximum range of intercept of a radar station located near an objective (group of objectives) being defended, with optimum trajectories, for ballistic missiles with a range of 3,200 km is 2,000 km, and for missiles with a range of 1,600 km it is 1,400 km.

Increasing the height of the antenna does not result in an increase in the detection range. In order to attain an increase in the detection range, it is necessary to move the radar stations away from the objectives (groups of objectives) being defended toward the directions from which strikes by strategic missiles are expected to come. In addition, in order to insure the timely detection of ballistic missiles it is advisable to exploit the new principle of radar-- coherent integration (kogerentnoye integrirovaniye) (random summation) (vyborochnoye summirovaniye), which consists of amplifying the strength of the useful signal (poleznyy signal)

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against the background of fluctuating (local) noises. A radar station, working on this principle, can quickly and correctly determine the distance, speed, and angular coordinates of a moving target within the limits of the line of sight.

According to our calculations, in order to insure the effective use of appropriate weapons (anti-missile), the minimum distance of the boundary of detection of ballistic missiles of operational-tactical designation, with the exception of missiles of the type of Honest John, Corporal, Sergeant, and Blue Water, must be within the limits of 370-620 km, and for missiles of strategic designation, within the limits of 1,420-- 2,100 km.

Taking into consideration the range of ballistic missiles of the Honest John, Corporal, Sergeant, and Blue Water types, as well as the distance of their launching positions from the main line of resistance, it can be assumed that existing radar stations for reconnaissance and target indication will detect these missiles in good time after they are launched. This pertains to missiles having a height of flight trajectory of not less than 4,000--5,000 m. It is imperative that the data obtained be processed automatically and transmitted to the anti-missile weapons in no later than 10-15 sec. for missiles of the Honest John type, and one to two min. for missiles of the Corporal, Sergeant, and Blue Water type.

The necessity for receiving data on the flight of ballistic missiles of operational-tactical designation (such as Pershing and Redstone) with ranges of 370-620 km and on missiles of strategic designation with ranges of 1,420--2,100 km requires that radar stations for reconnaissance have a detection range of up to 500 and 1,000 to 1,500 km, and an altitude capability up to 200 to 800 km. In connection with this, the system of anti-missile combat must have two types of radar stations for reconnaissance in order to assure the system's effectiveness in combating both the operational-tactical and the strategic missiles of the potential enemies.

From the radar stations for reconnaissance of operational-tactical missiles there should be formed: detection centers (uzel obnaruzheniya) consisting of four to six stations with ranges up to 500 km and altitude capabilities up to 300 km; and interception centers (uzel perekhvata) consisting of three to four stations

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with operational ranges up to 200 km and altitude capabilities up to 150 km. The number of centers will depend on the number of important objectives (groups of objectives) to be defended. The missile detection centers should be connected with the interception centers in a manner which will insure the automatic computation of data necessary for interception and the synchronous transmission of these data to the anti-missile launching sub-units (podrazdeleniye)

The detection and tracking of ballistic missiles of strategic designation should be carried out by special long-range detection centers, having radar stations with an operational range of up to 1,500 km, an altitude capability up to 800 km, and synchronous connections with missile interception centers which have stations with an operational range of up to 300 km and an altitude capability of up to 200 km.

It must be noted that early warning (dalneye obnaruzheniye) of enemy ballistic missiles can be carried out not only during the trajectory of their flight by radar stations with a great range, but also by picking up and amplifying the radio signals which are emitted by the powerful missile engines at the time of their firing. However, this method should only be supplementary (dubliruyushchiy) in the anti-missile combat system organized in a front.

For the detection and interception of strategic missiles the Americans are developing two interconnected systems-- a system of early warning (raneye obnaruzheniye) and a system of interception. The mission of the early warning system is the detection and identification of enemy ballistic missiles, the determination of the approximate trajectory data, and the transmittal of these data to the anti-missile combat means. The mission of the intercept system is the interception and destruction of enemy ballistic missiles at a safe distance from the objectives being defended.

Under simultaneous development are several systems for the interception and destruction of ballistic missiles (Nike-Zeus, Plato, and Wizard). The main system is Nike-Zeus. This system has three types of radar stations: scanning, determination of trajectory, and tracking; the system also includes computers, a tactical control center of the defense area, communication lines, and launching installations (startovaya ustanovka) with Nike-Zeus anti-missiles. The operational procedure of the system is as

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follows: after receiving the signal from the early warning center, the scanning radar station goes into action first; having a detection range of 1,600 km, it continuously scans (swings) in the direction of the expected attack within a 30° sector. After the target is detected, the station which determines the trajectory goes into operation; this station picks up the target at a distance up to 960 km and tracks it until it obtains precise trajectory data. Each anti-missile battery (batereya) has two radar tracking stations with an operating range up to 320 km; these stations go into operation upon a command from the radar station which determines trajectory. Both stations continuously feed target and anti-missile location data into a computer which, by means of radio commands, guides the anti-missile to the target. During the final phase (uchastok) of the anti-missile flight, the homing system goes into operation and insures the interception of the target.

In order to destroy enemy ballistic missiles in the air, both during the trajectory and as it begins to zero in on the target, anti-missiles are needed which have the tactical-technical characteristics for the reliable interception and destruction of enemy missiles at specified distances in relation to the objectives (troops) being defended. The system of anti-missile launching devices must assure the necessary acceleration before the sustainer engines (marshevyy dvigatel) are ignited, the timely ignition of the sustainer engines, and the accurate guidance and homing of the anti-missiles on the ballistic missiles of the enemy.

It is imperative to have such anti-missiles as would assure the destruction of enemy ballistic missiles regardless of their range, altitude, or speed of flight.

It seems to us that in order to destroy ballistic missiles of the Honest John type it is advisable to employ the troop surface-to-air (zenitnaya) missiles which have been developed. The effectiveness of such missiles has been shown by their range tests (poligonnoye ispytaniye) abroad, particularly in the USA. The deployment of an automated system of interception and its synchronization with the launching system of the troop surface-to-air missiles will provide the combat system needed against missiles of the Honest John type.

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For the destruction of operational-tactical missiles of the Corporal and Pershing type, it is necessary to have an anti-missile with a range of 100-150 km, a speed of not less than 1,000 m/sec, and an altitude capability of 50--100 km. It is advisable that a launching sub-unit for such anti-missiles have 8-10 launching mounts, a duration of firing cycle (tsikl strelby) of three to five minutes, and a preparation time for a repeat firing of not more than 10-15 min. The systems of reconnaissance, of interception, and of the launching of the anti-missiles should be interconnected by means of an automated system based on electronic computers.

To combat enemy ballistic missiles of strategic designation, it is necessary to have anti-missiles with a range on the order of 200-300 km, an altitude capability of not less than 100-200 km, and a speed of 3,000--5,000 m/sec and more. It is desirable that a launching sub-unit of such anti-missiles have not less than 8-10 launching mounts, a duration of firing cycle of not more than 5 min., and a preparation time for a repeat firing of 20-30 minutes. In order to increase the mobility of anti-missile launching installations, it is desirable to install them on railroad mounts, barges, ships, and prime movers with a high degree of roadability.

For anti-missile warheads it is desirable to have both a fragmentation-high explosive type to destroy enemy ballistic missiles in a vacuum (while in free flight trajectory), as well as a type capable of carrying a nuclear charge in order to insure the destruction of missiles during their flight through the dense layers or at the time of entry into the dense layers of the atmosphere (during the phase of stabilization).

Combat against enemy ballistic missiles can be made more effective by creating radio-jamming directed against the missile guidance systems in the initial phase of the trajectory and against the homing device during the final phase of the trajectory. Radio-jamming of the guidance systems of ballistic missiles in the initial phase should prevent the missile from entering its specified trajectory; the radio-jamming of the homing device should deflect the missile from its specified target, but with sufficient deflection to insure the safety of the objective being defended from the explosion of a high-yield nuclear charge. Radio-jamming can be created by special radio-technical jamming sets operating in the same frequency ranges as the guidance and homing systems of ballistic missiles.

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Objectives may also be protected from strikes by enemy ballistic missiles by concealing them with radar camouflage (protivo-radiolokatsionnaya maskirovka).

Under present-day conditions, a front, as a rule, will carry out operations in a theater of combat operations in coordination with operational groupings (obedineniye) of other branches of the armed forces. We have already pointed out above that in the front zone of operations we must be ready to combat ballistic missiles of operational-tactical and strategic designation, which will be used by the enemy against objectives in the front zone and against objectives in the deep interior of the country. Within the boundaries of the TVD (teatr voyennykh deystviy - theater of military operations) there should be a single system for the destruction of missiles in the air by the troops in that theater. It appears that the anti-missile defense system in a TVD will consist of the PRO (protivoraketnaya oborona - anti-missile defense) systems of the front and of operational groupings of other branches of the armed forces (the navy, long-range aviation - DA) which are deployed within the boundaries of a given TVD. The anti-missile defense of the zone of interior (tyl strany) will most likely operate in coordination with this system of anti-missile defense.

The anti-missile defense of a front can represent the first echelon of anti-missile defense organized in a given TVD, which, in turn, will be the first echelon of anti-missile defense of the country as a whole.

The task of the front anti-missile defense is to prevent strikes by enemy ballistic missiles against the troops and rear area objectives. As we have indicated above, the front anti-missile defense must include an operational system of special forces and means, intended specifically for combatting enemy ballistic missiles in the air.

Anti-missile defense must be continuous, active, and capable of repelling strikes by enemy ballistic missiles under all circumstances and at any season of the year or time of day.

Anti-missile defense in front operations can be set up according to the principle of defending the most important objectives. This is explained by the fact that at the present time the relatively small amount of ballistic missiles in the enemy's possession limit his use of them to particular objectives (formations of troops). In

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addition, the process of working out the necessary data for anti-missile launchings is relatively simpler when it is related to separate sub-units defending specific objectives. Hence it is possible to set up suitable equipment without a considerable expenditure of materiel.

At the same time, the anti-missile systems being formed on the basis of range for the defense of individual objectives will permit, as we see it, the defense of groups of important objectives (individual zones) in the front zone of action, if the distances between the targets do not exceed the operational range of the anti-missiles, i.e., anti-missile defense can be formed according to a zonal principle.

A front anti-missile defense is organized in close coordination with the anti-missile defense of adjacent fronts (fleets) and of the zone of interior. In organizing a front anti-missile defense, consideration should be given to the character of the operation being carried out by the front; and it should be in conformance with the concept of the operation and with the operational deployment of the troops.

Anti-missile defense can reach its goal when its forces and resources are combined with the measures for the direct protection of troop formations and objectives in the rear area of the front from strikes by ballistic missiles.

In the interests of PRO, all types of reconnaissance should be used to carry out continuous reconnaissance against enemy military industrial plants, supply depots, missile bases, and site locations for missile weapons. This reconnaissance should be organized in the theater of combat operations as well as in the front, both during the planning and the execution of the operation.

During the execution of an operation, the front radar centers for the detection and tracking of enemy ballistic missiles can be located outside the tactical zone, at a distance of not less than 60-80 km from the main line of resistance. Frequently the location of these radar centers may be designated by directives of the High Command (Verkhovnoye glavnokomandovaniye) for the purpose of using the data of these centers for the anti-missile defense of adjacent fronts and the zone of interior in a given theater of combat operations, and, in coastal areas, for the anti-missile defense of the fleet.

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The radar posts for control and assurance of intercept by anti-missiles are synchronously connected with the anti-missile launching system and should be located in the areas of the launching sites of the latter.

To protect the more important objectives in the front zone, it will be necessary to detach several anti-missile launching sub-units. The number of these sub-units will be determined by the importance of the objective, its nature and size, and the possible density and duration of the enemy missile strikes.

In defending an objective the anti-missile sub-units can be deployed in a sector (whence the missile attack is expected) in such a manner that their zones of fire will overlap in order to insure the concentration of fire of several anti-missile sub-units in repelling strikes of greater density. The distances between the anti-missile launching sub-units must not exceed the optimum distance needed for the firing of, let us say, three or four anti-missiles on the border of the zones of fire of adjacent sub-units (assuming that the enemy ballistic missile will be destroyed by this number of anti-missiles).

It is advisable to deploy the detached anti-missile sub-units around an objective at a distance which insures the effective interception of ballistic missiles and the control of the anti-missile sub-units by the control points of the anti-missile defense. It cannot be excluded that the anti-missile launching sub-units can be deployed at a distance of 50 - 100 km and more from the objective being defended, which may be determined by the distance of the approach of the missile to the objective, by the dimensions of the internal borders of the zone of fire of the anti-missile sub-unit, and the feasible distance from the control point of anti-missile defense (depending on the range of radiosynchronous transmission).

If several important objectives within the limits of a theater of combat operations are in close proximity to each other, a zonal defense can be created for their protection.

It would be advisable to deploy those anti-missile launching sub-units detached for zonal defense purposes in a sector from which the enemy ballistic missile strike is most likely to come; and they should be deployed in several rows (two or three) in such

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a manner that the zones of fire of these sub-units will overlap. The dense overlapping of the zones of fire of these anti-missile sub-units creates conditions for repelling a concentrated missile attack from the most likely direction, and it allows for the destruction of enemy missiles in the dead zones of adjacent anti-missile sub-units.

The total number of anti-missile launching sub-units needed by a front will depend, on the one hand, on the number of ballistic missiles which the enemy is able to use against objectives within the front zone and, on the other hand, on the probability of destruction of each missile by the weapons of the PRO. We must also take into consideration the maximum number of missiles the enemy can fire in a simultaneous launching. There should be a sufficient number of anti-missile launching sub-units in a front to insure the certain destruction of all ballistic missiles launched simultaneously by the enemy against front objectives or those flying over the front zone in the direction of the zone of interior.

If we calculate that four or five anti-missiles are needed to destroy one ballistic missile (according to American data 8-10 anti-missiles are needed to destroy one ballistic missile), then a front, according to our previously stated examples (see Tables 1 and 2), may have to launch the following in a 24-hour period:

-- in an offensive operation, up to (4-5) X (15-27) = 60-135 anti-missiles (combat against ballistic missiles of the Honest John type will be conducted principally by carrying out strikes against enemy site locations and assembly bases; in the air it will be conducted by surface-to-air missile units of the PVO system).

-- in defensive operations, up to (4-5) X 16 = 64-80 anti-missiles.

The indicated number of anti-missiles used in rapid fire by anti-missile sub-units, 15-20 launchings in a 24-hour period, can be launched by four to seven launching sub-units in an offensive operation and by four or five in a defensive operation. This number of anti-missile launching sub-units thereby makes up the necessary strength of a front.

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In view of the fact that a front system of anti-missile defense will be coordinated with the anti-missile defense systems of adjacent fronts and of the zone of interior, the number of anti-missile launching sub-units in a front can be decreased accordingly.

In the event that the missile strikes against objectives in the front zone are carried out in greater density, it will be necessary to increase the number of anti-missile sub-units.

The system of anti-missile defense in front operations initially can consist of several formations of the means of anti-missile combat:

-- formations of the means of combat against missiles of operational-tactical designation with a range of 50 to 100 km and speeds up to 1,000 m/sec; in our opinion, this formation can consist of PVO surface-to-air missile units which have new missile systems capable of destroying the above-mentioned missiles of the enemy;

-- formations of means of combat against missiles of operational-tactical designation with a range of 100 to 1,000 km and speeds of 3,000 m/sec and above;

-- formations of means of combat against missiles of strategic designation.

The development and refinement of missile and electronic technology will, evidently, increase the possibilities for the creation of a universal defense system which will insure effective combat against missiles of the most varied designations. Furthermore, this system will actually encompass combat against all enemy means of air attack, including piloted aircraft.

The successful combat against ballistic missiles in a front requires the organization of close communication between the means of reconnaissance and tracking of enemy missiles and the systems of anti-missile launching. The best way to achieve this close communication is to combine them into a single troop entity.

[redacted]

1.3(a)(4)

[redacted]

1.3(a)(4)

[redacted]

1.3(a)(4)

In our opinion, it would be desirable for a front to have an anti-missile brigade or regiment comprising several sub-units (three or four) for the detection and tracking of ballistic missiles, several anti-missile sub-units (five or seven), and several sub-units for radio-countermeasures [radioprotivodeystviye] (four -- five); all of these sub-units would be interconnected during combat by an automated system based on electronic computers. This brigade or regiment should be subordinate to the commander of front air defense troops.

As we have already indicated above, as the number of anti-missile units of a front increases, the existing PVO system will gradually grow into a system of PRO, headed by the chief of PRO troops.

Inasmuch as it is too difficult for a front to organize reconnaissance of the guidance systems of ballistic missiles of strategic designation during the initial phase of their trajectory, it would be advantageous, during front operations, to set up jamming principally directed against the homing devices of enemy missiles, in order to prevent them from homing in on their programmed objectives. It is advisable to locate the jamming sub-units in the directions of the probable flight of enemy ballistic missiles, on the approaches to the more important targets of the front zone, at distances which would assure reliable detection and the subsequent neutralization of the homing devices of the ballistic missiles.

The anti-missile defense system in front operations can be effective only if there is developed an expedient control system for the means which participate in combating enemy ballistic missiles. We believe that the control of the means of anti-missile defense can be centralized on the scale of a theater of combat operations for the destruction of missiles of strategic designation, on the scale of a front for the destruction of missiles of operational-tactical designation with ranges up to 1,000 km, and on the scale of an army for the destruction of missiles with ranges up to 50--100 km.

Thus, in order to insure success in combatting enemy ballistic missiles, it is necessary:

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-- to work out the following technical means of combat in a short period of time: radar stations for the early warning and tracking of ballistic missiles in the air; radar stations for controlling the anti-missiles; a system of automated control of all the means of anti-missile combat; various types of anti-missiles and stations for jamming the guidance systems and homing devices of ballistic missiles.

-- to supplement the present PVO system with means of combating enemy ballistic missiles and subordinating these means to the chief of front PVO troops; subsequently, to work out a unified system of combating the air enemy, which would include combating ballistic and cruise missiles (krylataya) and piloted aircraft on the scale of a front and which would operate in coordination with similar systems in adjacent fronts and in the zone of interior; considering that the principal means of air attack in the future will be missiles of various designations, such a system of combat can be called an anti-missile defense system;

-- to control the means of anti-missile combat from a control point of front PVO whenever these means are supplementing a front PVO system; upon the creation of an anti-missile defense system, it will be possible to control the means of this system from special control points organized in a front and, sometimes, in a theater of combat operations.

[redacted]

1.3(a)(4)

[redacted]

1.3(a)(4)