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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

30 November 1976

MEMORANDUM FOR: The Director of Central Intelligence

FROM : William W. Wells
Deputy Director for Operations

SUBJECT : MILITARY THOUGHT (USSR): Destruction of Enemy Air Defense Installations in the Flight Zone of an Airborne Landing Force

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 dwells on the use of artillery and missiles with conventional warheads to counter enemy air defense in support of an airborne landing operation. Included in the article are calculations of the number of installations in the flight zone to be neutralized and of rocket troop capabilities in terms of the expenditure of missiles to achieve the required duration and degree of neutralization. The authors examine the use of incendiary mixtures such as napalm, and the importance of secondary destructive effect as well as the use of salvo and single strikes to neutralize up to 88 percent of the targets. This article appeared in Issue No. 1 (83) for 1968.

[redacted]

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 [redacted]

[redacted]

William W. Wells

[redacted]

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SUBJECT

MILITARY THOUGHT (USSR): Destruction of Enemy Air Defense Installations in the Flight Zone of an Airborne Landing Force

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 1 (83) for 1968 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought". The authors of this article are General-Mayor of Artillery G. Biryukov and Colonel G. Khoroshilov. This article dwells on the use of artillery and missiles with conventional warheads to counter enemy air defense in support of an airborne landing operation. Included in the article are calculations of the number of installations in the flight zone to be neutralized and of rocket troop capabilities in terms of the expenditure of missiles to achieve the required duration and degree of neutralization. The authors examine the use of incendiary mixtures such as napalm, and the importance of secondary destructive effect as well as the use of salvo and single strikes to neutralize up to 88 percent of the targets.

End of Summary

[redacted] Comment:

[redacted] General-Mayor Grigoriy Fedorovich Biryukov has lectured at the Frunze Military Academy and has published articles on artillery and missiles in Red Star. Colonel G. Khoroshilov was a candidate of military sciences at the Military Artillery Engineering Academy.

[redacted]

Destruction of Enemy Air Defense Installations in the Flight Zone of an Airborne Landing Force

by
General-Mayor of Artillery G. Biryukov
and
Colonel G. Khoroshilov

The necessity of employing operational airborne landing forces in offensive operations carried out while employing only conventional means of destruction, is not in doubt.

At the same time the difficulties which must be overcome in a troop landing under these conditions, are obvious.

In this article we will discuss the specific question of neutralizing enemy air defense as one of the most complex tasks in supporting the employment of operational airborne landing forces.

If, when means of mass destruction are employed, this task is 70 to 80 percent fulfilled by delivering nuclear (chemical) strikes against enemy air defense installations using means of the front and Supreme High Command, then, when conducting combat operations with the employment of only conventional means of destruction, the situation is changed decisively. This is explained not only by the substantially lesser destructive characteristics of conventional weapons, but also by a reduction of the total number of means allocated, since a substantial part of the aviation and rocket troops of the front and almost all the means of the General Headquarters will be in a status of readiness to employ nuclear (chemical) weapons.

However, under certain conditions and when the aviation, rocket troops and artillery available to the front are used efficiently, in our opinion the landing of an operational airborne landing force in the enemy rear may be reliably supported. We will examine this in a specific example as it applies to the conditions of the Western Theater of Military Operations.

As shown by the experience of exercises and the results of research conducted at the Military Air Academy and the Military Academy i/n M. V. Frunze, the strength of the one operational airborne landing force employed in a front offensive operation usually did not exceed one airborne division. The landing was carried out on the second or third day of the operation, that is, when the success of the troops of the first operational echelon on the selected axis was determined, and the air defense system of the defending forces was already considerably weakened: some of the means were destroyed or were moving in connection with the retreat of the troops. The depth at which the airborne landing force was dropped as a rule did not exceed 200 kilometers. Up to 12 to 16 military transport aviation regiments were allocated to land one airborne division in one trip by parachute drop.

Success in negotiating enemy air defense largely depended on the nature of the flight and the actions of military transport aviation as a whole. Reducing the parameters of the combat formations of the military transport aviation units and large units by compressing them allowed reducing the depth of disposition to 100 to 300 kilometers, and the width of the flight zone -- to 40 kilometers. Proper selection of the flight profile was of no small importance. In the majority of cases the variant in which the flight up to the limit of long-range radar detection was carried out at altitudes of up to 7,000 meters, and up to the landing zone -- at altitudes of up to 1,500 meters, was acknowledged to be the optimum. The landing force was dropped from altitudes of 600 to 1,000 meters, and the aircraft returned to the front line at an altitude of up to 1,000 meters with subsequent climb to 3,000 to 4,000 meters. When flying at low altitudes the threat of enemy employment of Nike-Hercules surface-to-air missiles essentially was eliminated, and the aircraft detection range and the course profiles for firing all surface-to-air missiles were considerably reduced, as was the area of attacks by enemy fighters. The employment of radio and radar jamming was highly important to the success of the flight and landing of the landing force.

And finally, research results made it possible to conclude that in view of limited capabilities, not all enemy air defense means in the front zone may be subject to neutralization and destruction, but only those capable of effectively combating military transport aviation in its flight zone (see diagram).

For example, we think that, first, air defense fighter aviation will be directed against the landing force from airfields located 100 to 150 kilometers from the front line, and then from 200 to 300 kilometers away. Surface-to-air missile means (Nike-Hercules and Hawk batteries) represent the greatest danger to military transport aviation aircraft flying at altitudes up to 6,000 meters in a zone 250 kilometers back from the front line and up to 200 kilometers wide, and at altitudes up to 1,500 meters in a zone 220 kilometers deep and 90 kilometers wide, respectively. In the latter case the fire of Nike-Hercules batteries actually will have little effect.

When the flight altitude is up to 1,500 meters, antiaircraft artillery means should be neutralized only within the width of the flight zone of the landing force, that is, up to 40 kilometers along the front and up to 150 kilometers into the depth. The enemy reconnaissance and control organs in essence must be neutralized along the entire front of the offensive, however, the destruction of long-range detection posts should be attempted first in a zone up to 300 kilometers wide and up to 350 kilometers deep.

Based on the foregoing as applied to the conditions of the theater of military operations being examined, we determined the approximate number of air defense installations (means) which had to be neutralized in support of the flight and landing of the airborne landing force, taking into account the possible status of the air defense system of the defending enemy by the end of the second or third day of the operation. These data are set forth in Table 1.

Thus, depending on the military transport aviation flight altitude (up to 1,500 or up to 6,000 meters), the number of enemy air defense installations which have to be neutralized will equal 27 to 35 and 34 to 43, respectively.* All these installations, as can be seen from the diagram, are within range of the strikes of the rocket troops and partially within range of the artillery fire of the front.

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*Not counting the fighter aviation airfields in the zone farther than 150 kilometers, which may be destroyed by long range aviation forces or, as a secondary mission, by front aviation.

Table 1

Number of enemy air defense installations which should be neutralized in support of the landing of an operational airborne landing force

Type of Installation	Number of installations				
	Number within range	By the end of D2 or D3			
		Total	Those in the strike (fire) zone		
			artillery	tactical missile	operational-tactical missiles
Antiaircraft batteries of automatic weapons	10-12	6-8	6-8	-	-
Hawk SAM batteries	12-16	8-11	1-2	6-7	1-2
Nike-Hercules SAM batteries	20-24	13-16	-	4-6	9-10
Fighter aviation airfields (in zone up to 150 kilometers)	10-12*	7-8	-	-	7-8
Important control (reconnaissance) posts	10-11**	6-8	-	3-4	3-4
Total installations with flight of military transport aviation at altitudes of:					
up to 1,500 meters	42-52	27-35	7-10	9-11	11-14
up to 6,000 meters	52-63	34-43	1-2	13-17	20-24

*Of a total of 30 to 35 airfields
**Of a total of 15 to 20 control posts

Now, to answer the question regarding the capabilities of the rocket troops and artillery of the front to neutralize the installations listed in the table, it is necessary to determine beforehand the duration of neutralization of the air defense means, the expenditure of missiles to neutralize each installation, the possible strength of the rocket troops and their combat (fire) output.

The minimum required duration of neutralization of air defense means in support of the flight and landing of the landing force as applied to the conditions we have accepted is 1.5 to two hours. That this is so can be seen from the following calculations:

-- the duration of neutralization of installations during the flight of military transport aviation to the front line at an aircraft flight speed of 500 kilometers per hour is equivalent to

$$\frac{50 \text{ to } 100 \text{ km}}{500 \text{ kph}} = \frac{1}{10} \text{ to } \frac{1}{5} \text{ hour, or 12 minutes;}$$

-- the duration of neutralization during the flight from the front line to the landing area and back to a line in its own disposition located 50 kilometers from the front line, taking the length of the military transport aviation column (at least 100 kilometers) into account, is

$$\frac{150 \text{ km} + 150 \text{ km} + 50 \text{ km} + 100 \text{ km}}{500 \text{ kph}} = 1 \text{ hour, or 60 minutes;}$$

-- the duration of neutralization in the landing period is 30 to 40 minutes.

The expenditure of conventionally armed missiles to neutralize the most important air defense means depends on the yield of the warhead charges, the distance of the installations to be destroyed (missile flight range), the required degree of destruction of the target (installation) and its nature. The warheads of the tactical or operational-tactical missiles may be filled with conventional explosives (from 200 to 800 kilograms and more), napalm-type viscous incendiary mixtures, or means for radio and radar jamming.

Warheads with conventional explosive charges are basically intended for high-explosive effect at targets, where the main casualty-producing factor is the shock wave. According to the experience of the Second World War and postwar experiments, zones of heavy, medium and slight destruction are used in assessing the destructive effect of missiles against urban industrial-type installations. The radiuses of these zones are computed by the approximate formulas:

$$R_h = 0.3W^? \; ; \; R_m = 1.5W^?;$$

$$R_s = 5W^?;$$

where W is the weight of the explosive in kilograms.*

The parameters of the zone of medium destruction may be used in assessing the fire effect on the neutralization of personnel, since it has been established that the parameters of the zone of slight destruction are unstable. The radiuses of the zones are defined by the following values:

Explosive weight, in kilograms	R_m, meters	R_s, meters
300	67	220
1,000	150	500

*Short Course in the Theory of Missile Firing. Publishing House of the Military Artillery Engineering Academy i/n F. E. Dzerzhinskiy, 1961.

It should be remembered as well that besides the direct effect of the shock wave there also is the indirect effect, which is manifested in the destruction of people by debris, fragments, and rocks, and by their being struck by objects when equipment, vehicles, etc. are overturned. The employment of a warhead with an active casing makes the action of a high-explosive warhead at the target approximately 1.5 times as effective. Hence the radius of the zone of medium destruction for charges weighing 300 and 1,000 kilograms is increased to 100 and 220 meters, respectively.

Cluster-type warheads filled with fragmentation or incendiary elements are promising from the standpoint of increasing the effectiveness of destroying personnel (equipment) in the open. The latter, incendiary, effect is especially important, since the experience of the war in Korea (1950 to 1953) and current combat actions in Vietnam corroborate the high effectiveness of employing viscous incendiary mixtures. Warheads filled with viscous incendiary mixtures on the one hand possess a fire effect, directly destroying personnel and equipment, and on the other hand are an incendiary means, causing fire in a considerable area, which under certain conditions can spread rapidly and thereby reduce or completely eliminate the combat operation of the air defense means. This being the case, it is important to note that due to the steep trajectory on which the particles of the incendiary mixture scatter, neither a trench nor a pit reduces their destructive characteristics. It also should be taken into account that the neutralization effect resulting from R-300 missile strikes is achieved not only by rupture of the warhead, but also by explosion of the assured residual propellant components, after which large fires are generated. The results of the preliminary calculations made using the "P-1B" chart* for cluster-type tactical missiles and R-300 missiles with active casings (according to Table 2) provide the basis for determining the average expenditure of missiles for neutralizing the most important enemy air defense means.

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*Military Herald, No. 1, 1963, page 78

Table 2

Expenditure of Missiles with conventional warheads to neutralize air defense means when the set degree of destruction M=20 percent

Type of Missile	Installation (target)	Vulnerable area of target, sq. kms	Burst, sq. kms	Missile flight range, kms			
				Up to 25	26-35	36-45	Over 45
Tactical	Hawk battery position	0.2	0.05	1-2	3-4	8	16
	Nike-Hercules battery position	0.6	0.05	3-4	5-6	8	12
	Control post	up to 1	0.05	4-5	5-6	8-9	14

Type of Missile	Installation (target)	Vulnerable area of target, sq. kms	Burst, sq. kms	Missile flight range, kms		
				Up to 100	Up to 200	Up to 300
R-300	Nike-Hercules battery position	0.6	0.07	5-6	9-10	12-13
	Airfield	up to 3	0.07	11-13	15-17	16-18
	Control post	up to 1	0.07	6	12	13

For the convenience of operational calculations we will define the average expenditure of missiles to neutralize air defense means. As stated above, each installation must be neutralized for a relatively long time - 1.5 to two hours. Therefore the neutralization, especially by missiles, evidently should begin with a grouped strike (salvo) of two or three tactical missiles, and continue with alternating battery (single) strikes and grouped strikes, each time providing for the combined employment of missiles with conventional explosives and incendiary mixtures. The combination of warheads will allow faster disruption of the combat operation of the enemy air defense means.

For destruction by tactical missiles, the neutralization of Hawk surface-to-air missile positions should be considered the most typical objective. A Hawk battery can be neutralized in 20 to 30 minutes by the first grouped strike of three or four tactical missiles. To keep it in that status requires repeating such strikes another two or three times during the next one to 1.5 hours, and sometimes another two or three single strikes may be required between them. Thus, the average expenditure of tactical missiles to neutralize one Hawk-type surface-to-air missile installation is 12 to 16.

R-300 missiles will be employed most often against the most distant installations, and primarily against Nike-Hercules positions and airfields. Considering that the bulk of the Nike-Hercules batteries and a substantial number of the airfields will be located up to 160 kilometers away from the front line, the expenditure of missiles corresponding to a 200-kilometer range may be taken as a base. The sequence for delivering strikes may be approximately the same as when employing tactical missiles. In this case the average expenditure of R-300 missiles to neutralize one installation will be 12 to 17.

The complement of front rocket troops allocated to perform tasks to support the flight of the military transport aircraft with the landing force, in a number of instances may consist of at least five to six tactical missile battalions (15 to 18 launchers) and four to six missile brigades (36 to 54 launchers). This means that up to one-third of all the nuclear warhead delivery vehicles of the front, in addition to medium-range strategic missiles and long range aviation, will be ready for the

immediate employment of nuclear weapons in the front zone.

The combat (fire) output of the allocated rocket troops may vary, depending on the conditions of the situation. We think that in certain conditions an exception may be made by allowing two or three missile launches from one position for a short time. In this instance, by having launchers loaded for the initial strike (salvo) and the combat operation of the missile subunits and units properly organized, each launcher of the tactical missile battalions can carry out up to five launches from two positions in two hours, and the R-300 launcher -- up to two or three launches. The total fire output of the rocket troops allocated to destroy air defense means in support of the landing force will be 75 to 95 tactical missiles and 72 to 162 operational-tactical missiles.

Now, based on the average missile expenditure and fire output of the rocket troops, we may represent in its final form the capabilities of the rocket troops and artillery for neutralizing enemy air defense means to support the flight of a military transport aviation column to the landing zone. Artillery at a depth of up to 20 kilometers is able to neutralize six to eight antiaircraft batteries and one or two Hawk surface-to-air missile batteries. Tactical missile battalions can neutralize up to five to eight installations, and the allocated missile brigades -- up to five to 13 air defense installations. Thus, the allocated rocket troops and artillery will be able to neutralize a total of up to 17 to 31 installations. This means that in the variant in which military transport aviation flies at altitudes of up to 1,500 meters, up to 65 to 88 percent of the air defense means to be hit in support of the flight and landing will be neutralized. For a flight at altitudes up to 6,000 meters the relative proportion of the participation of rocket troops and artillery in neutralizing air defense installations will be less, and will equal from 33 to 53 percent.*

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*It is no longer necessary to neutralize antiaircraft artillery, and the total capabilities will be equivalent to neutralizing 11 to 23 installations instead of 17 to 23 (sic).

Thus, the rocket troops and artillery of the armies and front, as well as aviation, may play a major role in supporting the flight of the landing force. The extent of their participation is characterized by the fact that, with appropriate organization and support, they are able to take upon themselves from one-third to two-thirds of the total tasks to destroy enemy air defense installations in support of the landing operation, and thereby free considerable aviation forces to perform a wider range of tasks.

[redacted]

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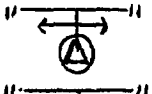
Key to diagram

Antiaircraft batteries (battalions) of automatic weapons

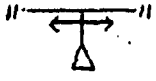
Airfields

Nike-Hercules surface-to-air missile battery

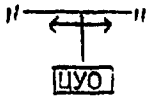
Hawk surface-to-air missile battery



Control and warning post



Long-range detection post

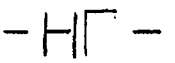
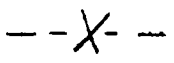
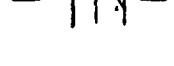
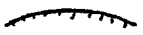


Control and warning center

Antiaircraft artillery brigade command post

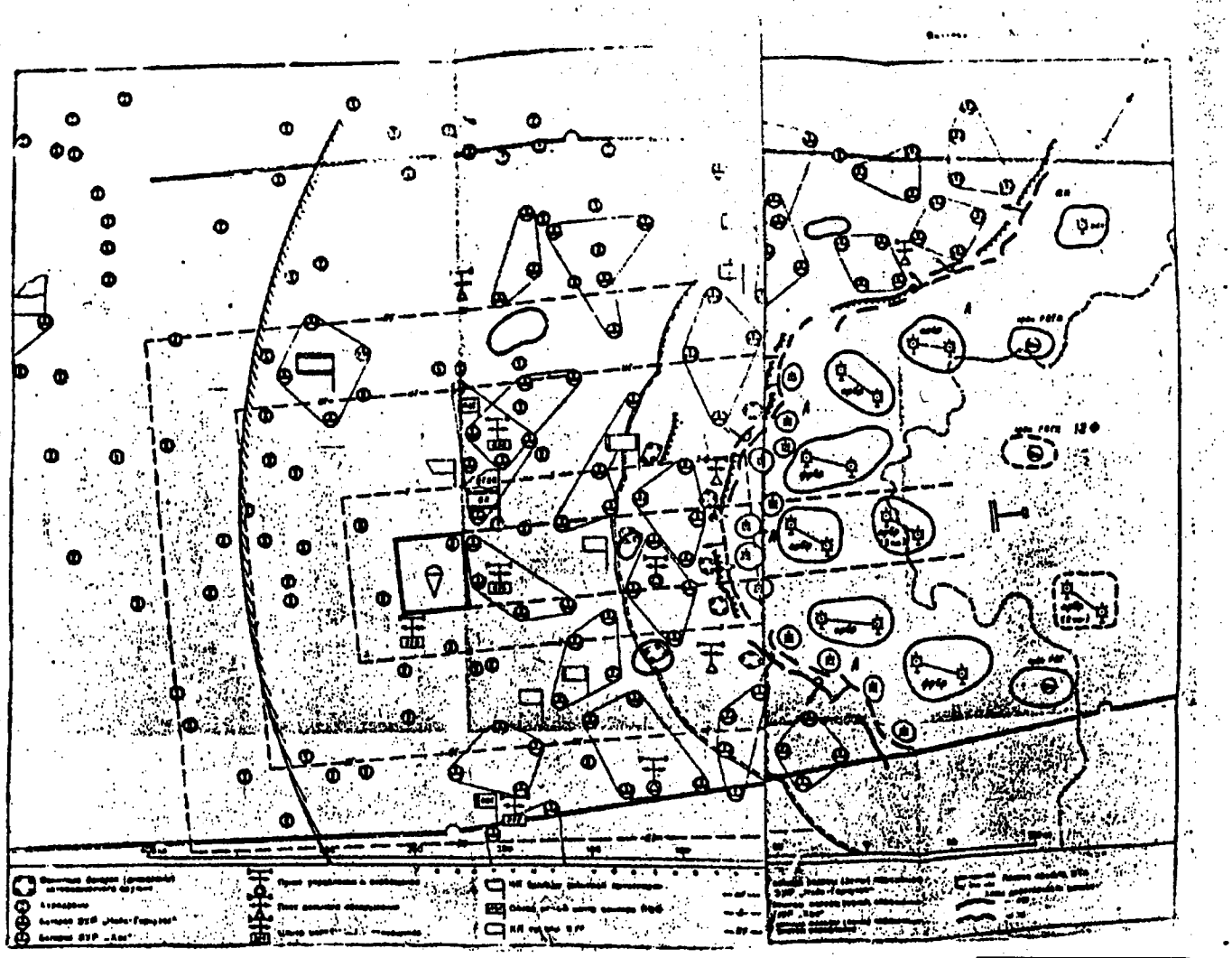
Air defense sector operations center

Surface-to-air missile group command post

	Limits of Nike-Hercules surface-to-air missile kill zone
	Limits of Hawk surface-to-air missile kill zone
	Limits of control post destruction zone
	Military Transport Aviation flight zone
	Zones of maximum range of strikes
	Operational-tactical missiles
	Tactical missiles
ОТАК	Allied tactical air force
БА	Air army
ТА	Tank army
А	Army
АК	Army corps
13Ф	13th Front

ФРБР	Front missile brigade
АРБР	Army missile brigade
АРБР [2 ЭШ]	Army missile brigade (2nd echelon)
ОРДН РВГК	Separate missile battalion of the Reserve of the Supreme High Command

Diagram of the possible position of enemy air defense means for opposing the flight and landing of the airborne landing force by the end of the second or third day of the front offensive operation



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