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CENTRAL INTELLIGENCE AGENCY
WASHINGTON 25, D. C.

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : ARTILLERY COLLECTION: "Principles of Combat Utilization of Atomic, Heavy Rocket, and Missile Artillery in an Offensive Operation of an Army" (Continuation)

1. Enclosed is a verbatim translation of an article which appeared in a Soviet Ministry of Defense TOP SECRET publication called Information Collection of the Artillery (Informatsionnyy Sbornik Artillerii).

2. In the interests of protecting our source, this material should be handled on a need-to-know basis within your office. Requests for extra copies of this report or for utilization of any part of this document in any other form should be addressed to the originating office.

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Richard Helms
Deputy Director (Plans)

Enclosure

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COUNTRY : USSR

SUBJECT : ARTILLERY COLLECTION: "Principles of Combat Utilization of Atomic, Heavy Rocket, and Missile Artillery in an Offensive Operation of an Army" (Continuation)

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Following is a verbatim translation of the continuation of an article entitled "Principles of Combat Utilization of Atomic, Heavy Rocket, and Missile Artillery in an Offensive Operation of an Army" which appeared in Issue No. 46, 1958 of the Soviet military publication Information Collection of the Artillery (Informatsionnyy Sbornik Artillerii). This publication is classified TOP SECRET by the Soviets and originates with the Artillery Headquarters of the Ministry of Defense. The beginning of this article was disseminated as CSDR-3/648,849. According to its preface, it is designed for generals and officers from commander of artillery of a corps, commanding officer of an artillery division (commanding officer of an engineer brigade), and higher.

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Principles of Combat Utilization of Atomic, Heavy Rocket, and Missile Artillery in an Offensive Operation of an Army

The determination of the required yield of an atomic charge for the destruction of a large target with one shot may be done in the following manner:

1. Calculate the area of the target S_{ts} (in km^2).

2. Determine the average V_p error as shown above.

3. According to the value of S_{ts} and V_p, refer to the relevant table and determine the radius of the destruction zone R_{zh} that corresponds to the mean anticipated percentage of the target area to be destroyed. (Below is Table 2, calculated for the values of the radii of the destruction zone that ensures 50 percent target destruction.)

4. According to the value of R_{zh} refer to Table 1 of the Manual and determine, in accordance with the nature of the target, the required atomic charge q_n.

Example: Determine the required yield of an atomic charge to destroy personnel in trenches with one shot if the target area $S_{t.s} = 9$ km^2 and the accuracy of shot is characterized by average errors $V_{ap} = 0.2$ km, and $V_{bp} = 0.15$ km.

Solution:

1. The example gives $S_{ts} = 9$ km and $V_p = 0.2$ km.

2. According to the values $S_{ts} = 9$ km^2 and $V_p = 0.2$ km, we refer to Table 2 and determine that $R_{zn} = 1.24$ km.

3. From $R_{zn} = 1.24$ km, with the help of either Table 1 or the Manual (diagram 115), we determine the required atomic charge for destroying personnel in trenches $q_n = 30{,}000$ tons.

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TABLE 2

Values of the Radii of the Zone of Destruction of an Atomic Burst (in km) Ensuring Mean Anticipated Destruction M = 50 Percent

V_p, km / S_{ts}, km²	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.25	0.23	0.37	0.53	0.70	0.86	1.03	1.19	1.36	1.52	1.69
0.50	0.28	0.40	0.56	0.72	0.88	1.05	1.21	1.37	1.53	1.71
0.75	0.33	0.45	0.60	0.74	0.89	1.07	1.23	1.38	1.54	1.72
1.0	0.37	0.50	0.62	0.76	0.92	1.09	1.25	1.40	1.55	1.73
1.5	0.45	0.58	0.66	0.80	0.93	1.12	1.26	1.41	1.57	1.74
2.0	0.52	0.62	0.70	0.84	0.95	1.13	1.29	1.44	1.60	1.75
3.0	0.64	0.72	0.80	0.92	1.00	1.18	1.34	1.50	1.63	1.78
4.0	0.76	0.84	0.88	1.00	1.03	1.24	1.40	1.54	1.67	1.82
5.0	0.85	0.92	0.98	1.08	1.10	1.30	1.44	1.59	1.70	1.85
6.0	0.95	1.02	1.10	1.15	1.16	1.35	1.49	1.64	1.73	1.90
7.0	1.04	1.10	1.16	1.22	1.23	1.40	1.53	1.69	1.77	1.93
8.0	1.10	1.14	1.20	1.28	1.29	1.43	1.57	1.73	1.80	1.96
9.0	1.18	1.24	1.28	1.32	1.35	1.49	1.61	1.78	1.86	2.00
10.0	1.24	1.30	1.34	1.38	1.40	1.54	1.66	1.84	1.89	2.10
15.0	1.44	1.50	1.55	1.60	1.66	1.72	1.84	2.02	2.05	2.18
20.0	1.79	1.85	1.86	1.87	1.88	1.91	2.02	2.17	2.23	2.34

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Determining Type and Height of Atomic Bursts

When carrying out assigned missions with the use of atomic ammunition , types of bursts may vary. Depending on actual conditions of the situation, either air or surface bursts may be used. When determining the type of burst it should be taken into consideration that with air bursts maximum destruction of personnel located in the open is achieved. An air burst is accompanied by a relatively low radioactive contamination of the terrain both in the area of the burst as well as along the route of movement of the radioactive cloud. The contamination of the air layer immediately above ground is tens of times less than with a ground burst, and the contamination of the terrain along the path of the radioactive cloud is insignificant.

Surface atomic bursts are accompanied by considerable contamination of the terrain, both in the area of the burst and along the path of movement of the radioactive cloud. Moreover, in the area of ground zero, the layer of air immediately above ground is contaminated by radioactive gases, but this does not occur during an air burst.

An analysis of the characteristics of the various types of atomic bursts makes it possible to determine that under the conditions of an offensive operation, a wider use will be made of air bursts to destroy enemy personnel and equipment because, together with the adequate destruction of enemy defensive objectives, they permit a swift advance through the ground zero of the bursts, without fear of contaminating friendly troops by penetrating radiation.

Surface bursts may be used during an offensive for the destruction of particularly strong defensive structures or strongly defended strong points, as well as for the destruction of deeply located reserves and other objectives, in whose areas no immediate activity of friendly troops is expected. Moreover, it is essential to take meteorological conditions into consideration, because they determine the possible direction of movement of the radioactive cloud.

Depending on the yield of the atomic charge and the nature of the target, atomic air bursts may be carried out at varying heights. Moreover, destructive factors, especially radioactive contamination and thermal radiation, manifest themselves in different ways with

changes in the height of the bursts. Low altitude air bursts have a somewhat wider radius of destruction of enemy troops located in sound shelters. When enemy personnel are located in open trenches and fire trenches, a high altitude air burst is more effective. With increased height of the burst the zone of radioactive contamination decreases, and this creates favorable conditions for subsequent operations of friendly troops in the areas of atomic bursts.

The height of an air burst can be determined by the following formula:

$$H = a\sqrt[3]{q} \qquad (3)$$

where H - height of burst in meters.

a - constant coefficient for given height.

q - yield of atomic charge in tons.

For practical calculations, the value of the constant coefficient "a" is taken as equal to 12 for a high burst, and 7 for a low burst, although in the general formulation of this question, air bursts at a height of over $10\sqrt[3]{q}$ are considered to be high and at heights of between $10\sqrt[3]{q}$ and $3.5\sqrt[3]{q}$ are considered to be low. Air bursts at heights lower than $3.5\sqrt[3]{q}$, by nature of their effect may be considered to be surface bursts.

Let us examine an example of determining the height of burst of an atomic charge with a yield of 8,000 tons.

For a high burst its height will be on the average:

$$H_{\text{h}} = 12\sqrt[3]{8000} = 240 \text{ m}$$

For a low burst its height on the average will be:

$$H_{\text{l}} = 7\sqrt[3]{8000} = 140 \text{ m}$$

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Determining the Safe Distance of Friendly Troops From the Ground Zero of Atomic Bursts

When planning atomic strikes it is first of all essential to provide for the safety of friendly troops from contamination by one's own atomic bursts. It is not always possible to use an atomic charge of the required yield and to select the most advantageous point for ground zero of the burst if this creates the threat of contaminating friendly troops. The task is to exclude completely the contamination of friendly troops.

This circumstance must be thoroughly considered when firing atomic ammunition at targets located close to friendly troops--for instance, when destroying company defense areas of the first line during the period of artillery preparation and especially when delivering atomic strikes during an operation when friendly troops are located outside shelters most often.

During atomic bursts the destruction of personnel and equipment is due to the shock wave, thermal radiation, and penetrating radiation. However, troops are advised beforehand of our own atomic strikes and the personnel have the opportunity to utilize engineer structures and natural features for shelter, as well as individual means of protection. In practice, this almost entirely eliminates the destructive effect of thermal radiation and penetrative radiation. Consequently, the safe distance of friendly troops should be determined on the basis of the destructive effect of the shock wave, which is characterized by the magnitude of excessive pressure and the duration of its effect.

The destructive effect of the shock wave depends on the yield of the atomic burst, the type of burst, and the degree of shelter for the personnel. When friendly troops are located outside shelter or in open trenches, the safe distance will be determined by the distance from the ground zero of the burst, at which the excessive pressure in front of the shock wave at the surface of the ground does not exceed 0.1 kg per cm^2. Depending on the yield and type of burst, this distance is determined by tables in the "Manual on Combat Properties of Atomic Weapons and Means of Antiatomic Defense" (pp 279, 280). However, the distance obtained does not take into account the possible deviation of the burst due to dispersion or errors in preparation.

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The safe distance of friendly troops ($L_{\underline{b}}$), taking into account errors of fire, may be determined by the formula:

$$L_{\underline{b}} = R_{\underline{b}} + 4V_{\underline{dr}} \qquad (4)$$

where $R_{\underline{b}}$ - the radius of safe distance of troops from the ground zero of the bursts;

$V_{\underline{dr}}$ - the mean error characterizing dispersion in range, taking into account preparation errors. (see formula 2)

Example: To destroy enemy personnel in front of the offensive front of a division, an atomic air burst is carried out with a yield of 8,000 tons. Our troops are located outside shelters. $V_{\underline{dr}}$ = 105m.

According to diagram 115 of the Manual we find the radius of safe removal (distance at which excessive pressure for an 8,000 ton charge will not exceed 0.1 kg per cm^2) is $R_{\underline{b}}$ = 2400 m.

By substituting the obtained value of $R_{\underline{b}}$ into the formula (4), we shall obtain:

$$L_{\underline{b}} = 2400 + 4 \times 105 = 2820 \text{ m.}$$

Consequently, ground zero of the atomic burst may be planned at a point removed from friendly troops to a distance, not less than the safe removal of the burst, i.e., 2820 m.

If friendly troops are located in blindages or light shelters, size of the $R_{\underline{b}}$ distance at which personnel are not affected decreases correspondingly by 2 or 3 times, and this decreases the distance of safe removal of troops.

A reduction of the distance of safe removal of friendly troops from the projected ground zero of the burst may be obtained by increasing the degree of sheltering of friendly troops, by utilizing atomic ammunition of lower yield, by selecting the most advantageous range of fire which would ensure minimum dispersion, and by increasing accuracy in preparation of fire data.

Above are given the simplest means and formulas for determining data necessary for planning the combat use of atomic, heavy rocket, and missile artillery, in order to show the method of approach to obtain these data.

Determining data for planning atomic strikes may be done by other methods as well, for instance with the aid of tables and graphs calculated in advance.

Artillery Reconnaissance Organization

The employment of atomic, heavy rocket, and missile artillery in an offensive operation presents new, extremely complicated and important problems for artillery reconnaissance as well as for the artillery topographic-geodetic and meteorological services.

The fundamental features of some of the most important enemy installations which may be destroyed by the fire of atomic, heavy rocket, and missile artillery have been examined above. First among such objectives are the enemy artillery weapons of atomic attack, free-flight and guided missiles of the "surface-to-surface" type, launch sites of antiaircraft guided missiles, combat formations of enemy troops, command posts, and airfields of their aviation.

Thus, under modern conditions, to ensure the fire of atomic, heavy rocket, and missile artillery, artillery reconnaissance must obtain in good time reliable data on the presence and exact location of the installations enumerated above. A peculiar feature in this instance will be the fact that in an overwhelming majority of cases these installations will be point targets, echeloned to a depth of up to 100 to 120 km and over, and in concentration areas and in their positions they are thoroughly camouflaged, including the building of similar dummy installations.

Consequently, the complexity of reconnaissance of these installations is evident. This in turn presents artillery reconnaissance with greater demands which consist first of all of the need to obtain information on the enemy to a comparatively great depth, in complicated camouflage conditions, with comparatively small installations to be reconnoitered.

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The organization of artillery reconnaissance (planning, allocation of men and weapons, assigning tasks to those who execute them, the collection, processing, and study of intelligence data and preparation of documents for the planning of fire, as well as checking and assistance from subordinates to the staffs) to ensure fire by atomic, heavy rocket, and missile artillery is done by the commander and the staff of army artillery or general bases.

Nevertheless, the following special features must be taken into consideration.

Because atomic munitions may be of varying yield and their employment will depend on the size and nature of the target, artillery reconnaissance must establish the nature and size of the target and also the coordinates of the target centers or of the centers of its independent elements.

For instance, if one examines the independent elements of the enemy defense from the viewpoint of their destruction by atomic munitions, then the artillery reconnaissance must determine not only the defense area of the battle group, but also company areas of defense. Having determined the concentration (disposition) area of the second echelon (reserve) of an army corps, it must determine the concentration areas of combat groups (battalions of motorized infantry or tank battalions); when conducting reconnaissance of free-flight and guided missile sites, artillery reconnaissance must locate the launch sites of each launching mount, etc. In other words, the degree of detail of the data obtained about enemy installations must make it possible to choose the most suitable atomic munitions for their destruction.

In this way, artillery staffs, when assigning missions for the organization of reconnaissance to subordinate units (large units), must determine beforehand the necessary degree of detail in the information to be obtained about the enemy and measurement data (coordinates) of specific targets or their elements.

A second feature is the need for a marked strengthening of the army special artillery group with air and ground reconnaissance equipment because, as shown below, it will be the primary executor of technical planning and employment of atomic artillery munitions in an operation.

Although earlier we considered it sufficient to provide the army artillery group with a certain number of aircraft sorties by the artillery fire-directing and reconnaissance air regiment and, even then as a rule, only at the start of an offensive operation, now apparently this will not be sufficient for an army special artillery group.

Under modern conditions for conducting combat actions, the commander of an army special artillery group will have to be allocated a considerably greater number of aircraft sorties by the artillery fire-directing and reconnaissance air regiment and also helicopters for the entire period of the operation to enable him to carry out systematic thorough reconnaissance with the object of determining in greater detail the locations of installations earmarked for destruction by atomic munitions and also for checking results of atomic strikes against the enemy.

The availability to the commanding officer of the army special artillery group of means of air artillery reconnaissance will necessitate the posing of the problem of communications of the group with the artillery fire-directing and reconnaissance air regiment in a new way. These communications should be direct and reliable and should be provided by the means of the independent artillery fire-directing and reconnaissance air regiment (otdelnyy korrektirovochno-razvedyvatelnyy aviatsionnyy polk--OKRAP) whose representative must constantly be on duty at the observation post of the commanding officer of the group. It is advisable to establish communications of units and subunits of the group with the artillery fire-directing aircraft when controlling fire through the radio sets of these units (subunits) when the aircraft reach their area of firing positions.

If an artillery fire-directing aircraft in the air is assigned the task of detailing a target, contact with it may be maintained through the radio set of the representative of the artillery fire-directing and reconnaissance air regiment.

Helicopters for servicing the fire of the army special artillery group may be allocated from the helicopter squadron of the army reconnaissance artillery regiment and the artillery fire-directing and reconnaissance air regiment. The landing places for these helicopters should be located close to the siting areas of the subunits (units) of the group. Communications with landing places and helicopters in flight should be established by an order of the group headquarters.

Helicopter flights for servicing fire should be made only over friendly territory.

The army special artillery group should also have at its disposal a sufficient quantity of ground reconnaissance equipment, especially radar sets. For instance, APSOM type sets may be utilized for fixing ground zeros of bursts of atomic munitions. Such checking of the results of fire done by the group will enable the commanding officer of army artillery to make quick changes in the plan of artillery fire in cases of considerable deviation in the ground zeros of bursts from the planned objectives.

In each instance of photographing enemy dispositions for reconnaissance purposes during the period of preparation and during the offensive operation, the artillery staff of the army must arrange for the preperation of an aerial mosaic by the photogrammetric battery for the staff of the army special artillery group, and also provide the latter with a complete set of small-scale photographs with grids before the start of the operation. These photographic documents are essential to the group headquarters to prepare atomic strikes against designated installations for determining the configuration and dimensions of the installation and for selecting the most suitable ground zero (center) of the burst (point of aim).

The third feature in the organization of artillery reconnaissance consists of the need for very rapid transmission of intelligence data concerning enemy weapons of atomic attack to the various artillery staffs and first of all to the staff of the army special artillery group. This requirement is due to the fact that these weapons will, as a rule, remain in the reconnoitered area for a short period of time and tardiness in opening fire on them may not produce the desired result.

To ensure missile artillery fire, the army artillery staff, when organizing intelligence against the enemy, must, through the intelligence section of the army headquarters and the artillery staff of the front, envisage the assignment to air reconnaissance of the army and front and also agent intelligence and combined-arms reconnaissance groups operating in the enemy rear, of missions to collect intelligence data in the operational depth of the enemy disposition. It must systematically strive to receive the necessary data from the appropriate staffs and intelligence agencies and pass it on to the commanding officers and staffs of units (large units) of missile artillery in good time.

At the same time, at the start of an offensive operation it will be necessary to allot to units (large units) of missile artillery a certain number of aircraft sorties from the artillery fire-directing and reconnaissance air regiment for final reconnaissance of targets (installations) before firing starts, as well as for checking results of fire.

Topographic-geodetic support for firing atomic and heavy rocket, as well as missile artillery, with the exception of some types, may be implemented in conformity with current instructions.

One occasionally encounters opinions that topographic-geodetic preparation in missile artillery units in all cases of the combat situation requires greater accuracy than for tube artillery. The precision of artillery survey that has been achieved at present, as well as the prospects of carrying out these tasks by technical means, permits the use of these methods also for missile artillery. The proof that this precision is acceptable for missile artillery may be seen from the following example.

Example: Firing is going on at a range of 150 km. At this range V_d = 600 m, and V_b = 750 m. Let us assume that the mean all-round error in the launch site survey equals 20 m, the mean error in orientation equals 0 - 01, and the mean error in determining coordinates of the target is 50 m.

In this case, the error in preparation of initial data for fire will be:

$$\text{in range} - E_d = \sqrt{20^2 + 50^2} = 54 \text{ m}$$

$$\text{in direction} - E_n = \sqrt{150^2 + 50^2 + 20^2} = 159 \text{ m}.$$

In this way, the error in preparing the initial data, due to errors in topographical survey of the launch site, does not essentially increase (in distance by 4 m and in direction by about 1 m) and in view of existing dispersion has no influence in practice on the accuracy of fire. This gives reason to believe that topographical survey of the firing positions (launch sites) of some types of missile artillery may be done on a large scale map (photograph) with precise astronomic (geodetic) orientation.

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The application of artillery survey methods for missile artillery does not exclude the need to take into account such geodetic elements as correction for curvature and rotation of the earth. These corrections are calculated and are incorporated in the preparation of initial data for firing.

An artillery and geodetic survey for fire in subunits armed with missiles with a lateral radio correction (BRK) system has substantial features which consist of the need to create a special geodetic survey grid net of higher precision, survey of launch pads, lateral radio correction stations, and RRK [trajectory radio correction] stations with considerably higher precision than that of the positions of the remaining artillery. This circumstance will call for planning and the carrying out of special additional measures by the army (front) artillery staff, in an artillery and geodetic survey for firing such missiles.

First of all, it will be necessary for appropriate instructions to be received, through the chief of staff of the army (front), by the topographic service of the army (front) for the allocation to the artillery of special topographic-geodetic subunits whose work will have to be planned, organized, and checked. It will be necessary to give units of missile artillery special instructions for the organization of the artillery and geodetic survey of launch batteries by the organic topographic-geodetic service subunits. Finally, it will be necessary to organize and conduct a check of the artillery and geodetic survey, and it would seem that topographic—geodetic subunits of the military-topographic service of the army (front) will have to be used for this purpose.

Meteorological support for the firing of atomic, heavy rocket, and missile artillery is carried out by methods essentially differing from those previously used in the artillery.

First of all, the fire of tube artillery with atomic munitions, as a rule, will be carried out without firing for adjustment. For this reason the artillery should be constantly provided with full meteorological reports for the duration of the entire operation so that it would always be fully prepared to deliver fire.

Meteorological support of heavy rocket artillery fire will be more complicated. The point is that when firing heavy rocket systems a significant influence is exerted by the wind in the active sector of

the trajectory. Therefore, it would seem that they will require a special meteorological report for the active sector of the trajectory.

Without going into the details of determining the various meteorological elements and taking into consideration corrections for meteorological factors, it should only be pointed out that the army artillery staff, during preparation for and during an offensive operation, must envisage comprehensive support of heavy rocket artillery units (subunits) with meteorological reports up to maximum trajectory heights by the meteorological battery of the artillery reconnaissance regiment. The army artillery staff should also issue appropriate instructions to staffs of units (subunits) of this type of artillery on the organization of wind probing of the atmosphere up to the heights of the active sectors of the trajectory by the organic meteorological subunits.

Meteorological support of missile artillery is conducted by its organic meteorological subunits.

To support missile artillery fire, the army (front) artillery staff must make arrangements for timely warning of units (subunits) of this type of artillery about dangerous weather phenomena (ground winds of over 15 m per sec., thunderstorm conditions in the atmosphere, etc.) as well as organizing and conducting a check of the work of their organic meteorological service subunits in accordance with current instructions.

Planning the Combat Employment of Atomic, Heavy Rocket, and Missile Artillery

It is known that the employment of atomic weapons must be at the basis of planning a modern offensive operation and consequently, of planning the combat employment of artillery.

Now it can already be stated quite definitely that the majority of the missions for employing atomic weapons on behalf of army troops, both during the preparation for breaching the enemy defense as well as during an operation, will be carried out by the atomic, heavy rocket, and missile artillery. For confirmation of this, one can refer to the experience of exercises both of our troops and those of our probable enemies at which 70 to 80 percent, and sometimes even more, of the total atomic munitions allotted for the operation were apportioned to the artillery.

Therefore, the most important and responsible task of the commanding officer and staff of army artillery is the planning and organization of the combat employment of atomic, heavy rocket, and missile artillery.

At the same time, it should be taken into consideration that the successful fulfilment of the missions of atomic, heavy rocket, and missile artillery will be achieved under the following conditions:

--efficient organization and continuous reconnaissance of the enemy for this artillery, primarily with the aim of locating objectives for destruction with atomic munitions;

--massing the fire of atomic, heavy rocket, and missile artillery on the axis of the main strike (decisive axes of army troop operations) and against the most important enemy groupings and defense installations;

--timely and accurate delivery of atomic strikes ensuring the fullest exploitation of their results by the advancing troops;

--efficient use of the yields of atomic munitions in accordance with the significance and nature of enemy installations, operating conditions of friendly troops, and the skilful use of a combination of atomic munitions with artillery firing conventional munitions;

--timely and efficient distribution of missions (installations to be neutralized) between the types of artillery and aviation and maintaining constant coordination between them;

--creation of the most advisable grouping of artillery, ensuring its constant coordination with the infantry, tanks, and other arms of troops;

--timely and complete materiel-technical support of artillery fire.

The work of planning the combat employment of artillery starts with the preparation of suggestions for the commanding officer of the army about the combat employment of artillery in the operation. First of all, calculations on the combat employment of atomic, heavy rocket, and missile artillery are prepared.

In accordance with the purpose of this article, we shall examine only the questions of planning and organizing combat employment of artillery which concern atomic, heavy rocket, and missile artillery.

The commander of army artillery will receive the necessary data for planning from the commander of the artillery of the front and the commander of the army.

From the directions of the commander of artillery of the front he will usually know: which missions in the offensive zone of the army are to be carried out by the means of the front (missile artillery and aviation); the reinforcement of the army with atomic, heavy rocket, and missile artillery; the expenditure of munitions (with atomic and conventional charges); yields of the atomic munitions; the composition and duration of artillery preparation for the assault (in case the front works out the artillery preparation schedule).

From the directions of the commander of the army he can learn the nature of possible enemy operations, missions of the army in the operation, the concept for conducting the operation, the breakthrough sector (sectors), the operational formation of troops, the order and time limits for commitment of second echelon large units into combat, and time limits for army readiness for the offensive.

The proposals of the commander of artillery for the employment of atomic, heavy rocket, and missile artillery must clarify the following basic questions:

--capabilities of the army artillery to deliver atomic strikes, taking into account the missions being fulfilled by the front;

--distribution of atomic munitions for fulfilling missions of artillery preparation for the assault and offensive and during an operation;

--the most advisable installations and targets for delivering atomic strikes during the period of artillery preparation;

--time and procedure for delivering atomic strikes and estimated enemy losses;

--employment of atomic weapons by the army artillery during an offensive;

--safe removal of friendly troops when delivering atomic strikes, both during the period of artillery preparation and during the offensive;

--distribution of objectives and targets between the atomic, heavy rocket, and missile artillery and aviation, as well as the yields of the atomic munitions being used against each objective;

--objectives to be neutralized by heavy rocket and missile artillery with conventional charge munitions, both during artillery preparation and during the operation;

--organization of control and the grouping of atomic, heavy rocket, and missile artillery;

--areas of deployment into combat formation of the atomic, heavy rocket, and missile artillery;

--manner of antiaircraft artillery cover and other measures to provide combat security for the employment of atomic weapons by the artillery;

--manner of materiel-technical support of combat operations of atomic, heavy rocket, and missile artillery.

After the army commander has made a decision, the army artillery staff works out a definite plan for the combat use of artillery in the operation.

Moreover, the decision of the army commander will clarify the data necessary for planning, contained in the proposals of the commander of artillery, namely: distribution of atomic munitions for the period of artillery preparation and for fulfilling missions during the operation; enemy objectives to be neutralized by atomic strikes during the period of artillery preparation and at the start of the offensive; the procedure for the delivery of atomic strikes during the period of artillery preparation; etc.

Without examining the whole volume of work in planning the combat employment of artillery, let us examine the example of planning atomic strikes for the period of artillery preparation.

Let us suppose that the army has been reinforced by one battalion of atomic artillery, four battalions of heavy rocket artillery (of which one is type I, one is type II, and two are type III) and one battalion of missile artillery.

The Army has been allocated 29 (units) of atomic artillery munitions for the operation including:

--for atomic artillery--9 shells, each with a yield of 10,000 tons;

--for heavy rocket artillery types I and II--15 rockets of which 6 are of 10,000 tons each and 9 of 15,000 tons;

--for missile artillery--5 missiles at 30,000 tons each.

Expenditure of atomic munitions is allocated as follows:

--for the first day of operation 18, of which 15 are for artillery preparation, including 2 missiles;

--for the subsequant days of the operation--6;

--in the army commander's reserve--5.

It has been decided to neutralize the following with atomic artillery munitions during the period of artillery preparation:

--one "Corporal" battalion (in the firing position or in the waiting area);

--two atomic guns and two "Honest John" platoons when they move up into firing positions;

--seven company defense areas in the enemy battle position, of which four company areas are in the first echelon;

--two tank battalions (batalon) in concentration areas;

--one army command post.

It is advisable to distribute the missions of neutralizing these objectives approximately as follows.

The neutralization of company defense areas of the first echelon should be done with atomic munitions having a yield of 10,000 tons each, and this mission should be assigned to the atomic artillery battalion.

The safe removal of friendly troops from the ground zeros of atomic bursts under conditions when our forward units are located in blindages and shelters and the range of fire is some 10 km will be about 1,200 to 1,300 m.

Consequently when our troops are removed 500 to 600 m from the enemy main line of defense, the ground zeros of atomic bursts may be fixed approximately in the centers of company defense areas of the first line.

The neutralization of company areas in the depth of the enemy combat position should be planned for the heavy rocket artillery battalion using type I missiles with a yield of 10,000 tons and for the atomic artillery battalion.

Because the distance of these objectives wholly guarantees the safety of our troops from the effects of the shock wave, the choice of ground zero of the atomic burst is determined with the object of achieving the greatest degree of target destruction.

The neutralization of atomic guns, "Honest John" launching mounts and tank battalions (batalon) in concentration areas will also be done by the heavy rocket artillery types I and II and the battalion of atomic artillery.

It would be advisable in this context to plan the heavy artillery strikes against atomic guns and "Honest John" launching mounts with 10,000 ton shells and against tank battalions with shells of 15,000 tons.

The neutralization of the "Corporal" battalion and the army command post may be done by the missile artillery battalion with the expenditure of one missile with a special charge for each objective.

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The selection of atomic charges for the destruction of the indicated objectives was based in this case not only on the necessity of obtaining reliable neutralization of targets and safety of friendly troops, but also on the atomic munitions allotted to the army and the range of fire of the artillery available in the army.

Taking into consideration the nature of enemy objectives to be destroyed and the operations of our troops, it is advisable to schedule high air bursts for the indicated targets.

The quantity of artillery using atomic munitions available in the army makes it possible to deliver strikes simultaneously against all objectives scheduled for neutralization.

Beside atomic strikes, the heavy rocket artillery may be assigned the missions of neutralizing enemy objectives with conventional charge munitions.

Under the conditions of our example, the army will have three type III heavy rocket artillery battalions. During the period of artillery preparation these battalions are capable of firing two salvos each (at the beginning and at the end of it). On the basis of this, they may be assigned the mission of neutralizing two or three objectives, for example, two combat groups from the complement of divisional reserves and the enemy divisional command post with a munitions expenditure of two battalion salvos for each objective.

The most typical missions of the atomic, heavy rocket, and missile artillery during an operation will be: the destruction of enemy atomic attack weapons, neutralization (annihilation) of his reserves and the repelling of their counterattacks and counterstrikes, ensuring the commitment of second echelon large units of the army into combat, supporting the precipitate capture of enemy defense zones, and the forcing of water obstacles.

As already stated above, these missions can, to a certain extent, be defined and planned beforehand, when the operation is still being prepared, so that only their clarification will be required during the operation.

Nonetheless, this condition will only refer to a certain number of the missions. It should be borne in mind that with the initiation of an operation, great changes will occur in the enemy disposition of troops and that the intelligence previously obtained concerning objectives to be destroyed by the artillery will no longer conform to reality. In the first place, this will be true as regards enemy atomic attack weapons and his reserves.

It follows that many new fire missions may arise during an operation.

The most important condition for ensuring the successful execution of fire missions by artillery during an operation is continuous reconnaissance (last minute reconnaissance) of objectives, especially those to be destroyed by atomic strikes.

To give the new types of artillery maximum time for preparing to deliver fire, they should be provided beforehand with intelligence data concerning enemy objectives for whose neutralization (destruction) they may be enlisted. This data must reach both the staff of the army special artillery group as well as the units (subunits) of atomic, heavy rocket, and missile artillery.

During an operation the coordination of atomic artillery strikes with the actions of tanks and infantry acquires very special significance so that results of atomic strikes may be used to the maximum by the advancing troops. For this reason, both the staff of the army special group and the commanding officers of artillery units should constantly know the situation of friendly troops and clarify it immediately prior to delivering an atomic strike. This is also essential to ensure the safety of friendly troops when delivering atomic strikes, taking into consideration that during the operation the advancing troops, at the moment of the atomic strikes, will often be located in the open or will only use folds in the terrain and individual means of protection for cover.

During an operation, considerable use should be made of the fire of heavy rocket artillery using conventional munitions. It acquires special significance for destroying deeply located objectives, out of the range of fire of tube and field rocket artillery.

Moreover, one must mention such cases from the experience of exercises when, in order to neutralize deeply located enemy objectives, a considerable grouping of tube artillery was moved up, while the fire of heavy rocket artillery was not utilized although the enemy objectives were within its range of fire. Thus, a favorable opportunity was missed to destroy these enemy objectives.

The planning of the movement of atomic and heavy rocket artillery and missile artillery attached to the army is done on the basis of the decision reached by the army commander concerning the use of atomic artillery weapons during an operation and is coordinated with the tactical and operational missions being fulfilled by the army troops. The manner of movement is also determined by artillery missions, its maximum effective range, the speed of movement, time required for deployment and preparation to deliver fire, and it also depends on the speed of the troop advances.

It is advisable to move atomic and heavy rocket artillery by batteries (platoons) if they have only atomic munitions. Heavy rocket artillery having only conventional munitions should be moved by battalions.

When planning a move it is necessary to bear in mind the need for timely readiness of atomic and heavy rocket artillery to fulfil the most important missions during an operation. For example, the delivering of atomic strikes against the enemy second line of defense in order to create conditions for breaching it in a rush, destroying enemy reserves moving up and repelling their counterattacks (counterstrike), as well as ensuring the capture in a rush of the enemy army defense zone, etc., are some of these.

Calculations show that at the average rate of troop advance, the movement of some individual atomic and heavy rocket artillery batteries of types I and II should be started when the enemy combat position is breached by our troops. The length of the bound for the first move will be, on the average, 15 to 18 km. The march, deployment, and preparations for firing in the new area will take about two hours.

When the subunits which have moved are ready, the moving of the remaining subunits of atomic and heavy rocket artillery of types I and II should be initiated. The siting area for them is fixed bearing in mind the progress of the advancing troops. At the rate of advance of 30 to 40 km in a 24-hour period, atomic and heavy rocket artillery of types I and II may make up to two or three moves in a 24-hour period.

Taking into consideration the great range of fire of the heavy rocket artillery of type III, its move may be started after the capture of the enemy first line of defense by our troops. It is advisable to select its new siting area beyond the first zone. The length of the bound will then be 25 to 40 km. An average of 2.5 to 3 hours will be required to organize and carry out the march, to deploy in combat formation, and to prepare for fire.

On the average, during one day of an operation, it is possible to move the heavy rocket battalions of type III once and sometimes twice.

Subsequent moves of heavy rocket artillery should be planned on the basis of the need to support troop actions when fulfilling highly important missions during the operation--for instance, when capturing the enemy army defense zone, when forcing a water obstacle, etc.

The movement of atomic, heavy rocket and missile artillery is usually carried out not to the firing sites, but to waiting areas where subunits are given their fire mission and prepare to fire. When it is necessary to open fire immediately, the fire batteries may assume sites directly without waiting for the engineer preparation of them.

The great range of fire of missile artillery makes it possible to employ it without moving through almost the entire depth of army operation. Nevertheless, it is advisable to make at least one move of missile artillery in order to support the operations of troops carrying out the subsequent mission of the army. It seems advisable to start moving missile artillery after fulfilling the immediate mission of the army and after committing the second echelon to combat.

When organizing the move, great attention should be paid to ensuring the secrecy of its implementation.

Obviously, besides the general measures for ensuring the move, the need will arise to take special measures which will take into account the distinctive features of the new types of artillery--for instance, the use of special camouflage devices for atomic artillery guns, transport-loading vehicles (transportno-zaryazhayushchaya mashyna) with rockets for heavy rocket artillery, etc.

To expedite movement, it is advisable to clear beforehand the routes allotted for the movement of new types of artillery and to organize supervision of the move, with the participation of officers from the army artillery staff in a number of cases.

The planning of combat employment of atomic, heavy rocket, and missile artillery is embodied in the plan of combat employment of artillery in an army offensive operation.

Experience of exercises shows that it is not advisable to draw up a separate document on the combat employment of atomic, heavy rocket, and missile artillery at the army artillery staff.

The part of the plan dealing with the combat employment of atomic, heavy rocket, and missile artillery must cover the following: atomic strikes by artillery against enemy installations to be neutralized during the period of artillery preparation and during the operation, showing the yield of the shell (missile), type and height of burst (high, low), and time of delivery; the missions for neutralizing enemy installations with conventional munitions; the combat formation of artillery at the departure position for the offensive, movement and maneuvering of artillery during the operation; the distribution of munitions expenditure both atomic and conventional for missions (for days of operation); artillery grouping (composition of army special artillery group (ASAG) and units remaining directly subordinate to the commander of army artillery; the regrouping and maneuvering of artillery during the operation; the manner of movement of ASAG and directly subordinate units.

The necessary calculation data may be done in the form of separate working documents and, if necessary, may be entered into the plan.

Missions for units of atomic and heavy rocket artillery will be assigned by the artillery commander through the commanding officer of the army special artillery group and, in the case of missile artillery, directly to the commanding officer of the unit (battalion, brigade).

When assigning the missions, the artillery commander must indicate to the commanding officer of the group and to the commanding officer of the missile artillery unit:

[redacted]

--brief information about the enemy, especially on the activities of his aviation, employment of weapons of mass destruction, the possibility of operations by airborne forces, etc.;

--brief information on the tasks of friendly troops;

--objectives for destruction, their nature, and the approximate coordinates of ground zero (center) of the burst;

--expenditure of shells (atomic and conventional), time for delivering the strikes against each objective to be destroyed;

--type, height of bursts (in cases of air bursts), and yield of the munitions used in thousands of tons;

--time limits for readiness to open fire;

--siting areas (primary and alternate), time for assuming combat formation, and movement routes;

--organization of antiaircraft artillery cover;

--engineer equipment reinforcement to expedite the fulfilment of engineer works;

--railheads (reception points for shells and fuel), manner and time of atomic warhead delivery;

--basic missions during the operation which the army special artillery group and missile artillery units must be ready to fulfil;

--procedure of movement during the operation, new siting areas, and movement routes;

--signals for opening and ceasing fire.

Besides this, the army artillery staff gives directives on combat support, organization of communications, artillery survey, and provides a list of coordinates of the points of the geodetic and artillery control survey net in the artillery deployment area.

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Grouping and Combat Formation of Atomic, Heavy Rocket, and Missile Artillery in an Offensive Operation

The reinforcement of the army by atomic, heavy rocket, and missile artillery in an offensive operation is determined in each individual case based on the missions to be fulfilled by the army, its place in the operational formation of troops of the front, availability of new types of artillery at the disposal of the front, quantity of atomic artillery munitions allotted to the army, and other specific conditions of the situation.

On the average, one may consider that a combined-arms army, when preparing for an offensive operation, may be reinforced by 1 to 2 battalions of atomic artillery and 3 to 5 battalions of heavy rocket artillery.

Also, depending on the missions of the army and conditions in which it will operate, the army may be reinforced by 1 to 2 battalions and sometimes also by a brigade of missile artillery.

The presence of such a quantity of new type artillery in the complement of the army demands a determination of the most efficient forms of employing them, ensuring reliable control of units, their coordination with army troops and aviation, and most important, timely and effective fire of this artillery on behalf of the main grouping of army troops.

As experience of exercises shows, it is advisable to integrate the units of atomic and heavy rocket artillery into the army special artillery group (ASAG) and have at the head of this group the commanding officer and staff of the breakthrough artillery division (artilleriyskaya diviziya proryva--RVGK), or if it is not present in the army, the commanding officer and staff of the army artillery division or rocket artillery brigade.

The commander and staff of the army special artillery group are charged with the direct organization and direction of the combat operations of atomic and heavy rocket artillery units, in accordance with the decisions made for their combat employment and the missions assigned to them. Moreover, a particularly important mission is the specific planning and preparation of atomic strikes.

The duties of the commanding officer and staff of an army special artillery group may be defined approximately as follows:

--organization of reconnaissance and last minute reconnaissance of objectives designated for destruction by atomic munitions and conventional munitions;

--organization of topographical and meteorological support for fire of units of the group;

--selection and equipping of fire positions and waiting areas and direct control of the movement of units of the group to these areas;

--organization and preparation for firing (assigning missions to units of the group; determining the initial settings for firing, including the determination of the most advantageous point of ground zero and height of the atomic burst, safe removal for friendly troops, and anticipated enemy losses; determining the procedure of fire at targets with conventional munitions; adjustment, correction, and control of fire);

--observation of results of atomic strikes, fixing ground zeros of atomic bursts;

--direct control of materiel-technical support of fire and combat operations of units of the group (organization of assembly of munitions, transport and supply of munitions, fuel, POL, etc. to units).

Besides the above, during an operation the staff of the army special artillery group organizes reconnaissance of new siting areas for units of the group and movement routes to them and carries out direct control of movement of units (subunits) and of their deployment and preparation for delivering fire in the new areas. To fulfil the missions of reconnaissance of the enemy, the army special artillery group, as was already stated above, should be reinforced by artillery fire-directing and reconnaissance aviation.

At the same time, the assignment of this mission to the army special artillery group does not at all mean that the reconnaissance of enemy objectives to be destroyed by atomic and heavy rocket artillery fire is turned over in its entirety to this group. This mission will be performed by the joint efforts of all types of reconnaissance, and it will be organized by army headquarters.

In individual cases, for instance, when a division is preparing a breakthrough on an independent axis and separated from the main forces of the army, it may be reinforced by independent batteries (battalions) of atomic and heavy rocket artillery.

It is advisable not to include the independent batteries (battalions) detailed for reinforcing divisions in the complement of the artillery groups, but to have them directly subordinate to the commander of divisional artillery.

However, the providing of atomic and heavy rocket artillery for the disposal of the commanding officer of the division does not mean the transfer to him of all functions connected with the employment of atomic munitions.

Even in this case atomic munitions will be employed at the decision of the commander of the army and in accordance with the plan of combat employment of army artillery in the operation. The commanding officer of the division and the commander and staff of divisional artillery will participate directly in planning atomic strikes in the offensive zone of the division and in organizing the coordination of divisional units with artillery subunits using atomic munitions.

Under certain conditions of the situation the commanding officer of the division may be given the right of independent decision for delivering an atomic strike by artillery operating in the offensive zone of the division.

It is advisable to employ missile artillery, should the army receive such reinforcement, directly subordinate to the army artillery commander.

It is inadvisable to include it in the army special artillery group because the great difference in the performance characteristics of the systems would make it extremely difficult to control the group.

Basically, the requirements for the combat formation of the new types of artillery are the same as those for tube artillery--conformity with the nature of the assigned missions, ensuring reliable destruction of the enemy with great economy of fire, secrecy of disposition, and low vulnerability from strikes by enemy atomic weapons, artillery, and aviation. At the same time, it is necessary to bear in mind certain distinctive features of the combat formation of atomic, heavy rocket, and missile artillery.

As distinct from conventional artillery, the new types of artillery assume combat formation at a greater depth. Their combat formation is much more dispersed along the front and depth and is, as a rule, located away from troop concentrations and other installations attracting enemy attention.

Their great vulnerability and the difficulties of camouflaging weapons and special equipment make increased demands on the camouflage qualities of the terrain in the area for deploying in combat formations. The combat formation location areas must have good approach roads ensuring the possibility of moving weapons and special equipment of large dimensions and great weight. It should also be remembered that the new types of artillery are objectives of primary importance for enemy reconnaissance. For this reason, all measures concerning the preparation of their siting areas and movement routes, as well as their assuming of combat formations, must be carried out in strictest secrecy.

Firing position areas for units (subunits) of atomic, heavy rocket, and missile artillery must be assigned after the allocation to these units of targets to be neutralized, and the previously selected fire position areas should be worked out in greater detail in accordance with fire missions of the units (subunits).

The combat formation of atomic and heavy rocket artillery battalions consists of the combat formations of the batteries, the command post, and the waiting area.

A battery may be assigned an area of about 5 to 8 km along the front and up to 10 km in depth for deployment in combat formation.

The distance of atomic and heavy rocket artillery firing positions from the main line of resistance is determined depending on the nature of the missions being performed and the performance characteristics of the systems with which the battalions are armed. The distance of a firing position should ensure the most advantageous range of fire for a given target, and this is especially important when firing atomic munitions at objectives located a short distance from friendly troops.

Depending on the assigned fire missions, the range of fire of the systems, and also conditions of terrain, atomic artillery firing positions may be selected at a distance of up to 8 to 10 km from the enemy main line of resistance, and those of the heavy rocket artillery at a distance

of 4 to 15 km. In a number of cases, in order to destroy the most distant objectives, especially atomic attack weapons, individual batteries (guns) may be moved closer to the main line of resistance.

Fire subunits of atomic and heavy rocket artillery are usually located in the waiting area at a distance of 5 to 10 km from the firing position and occupy it immediately before opening fire. As a rule, the weapons fire a small number of rounds (1 to 3) with short intervals between rounds, from the same fire position after which, for safety reasons, they either move to a previously prepared alternate fire position or are withdrawn to the waiting area.

Along the front the combat formation of missile artillery subunits occupies more or less similar areas to those of atomic and heavy rocket artillery, but they have somewhat greater depth.

Bearing in mind the great range of fire of missile artillery, its siting area may be located at a considerably greater distance from the main line of resistance. The siting area is assumed by missile artillery from concentration areas, the removal of which should not exceed a one night march.

The move of atomic, heavy rocket, and missile artillery units to firing positions should be carried out in such a way that their stay at the positions, prior to opening fire, is reduced to the minimum required for ensuring their readiness to open fire. For this reason, it is advisable to time the move to firing positions as near as possible to the beginning of the artillery preparation.

Nevertheless, atomic, heavy rocket, and missile artillery may be assigned missions of combating atomic attack weapons and also of frustrating a possible enemy counterpreparation, even before the beginning of our offensive. For performing these missions, part of the artillery (individual guns, launchers, and sometimes subunits) should be moved to firing positions, even before the main mass of army artillery is moved forward.

* * *

The recommendations for planning and organizing combat operations of atomic, heavy rocket, and missile artillery examined in this article do not exhaust all the content of the questions raised in the article, and, of course, cannot be considered final. The propositions set forth in the article require checking during future exercises as well as further development.

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