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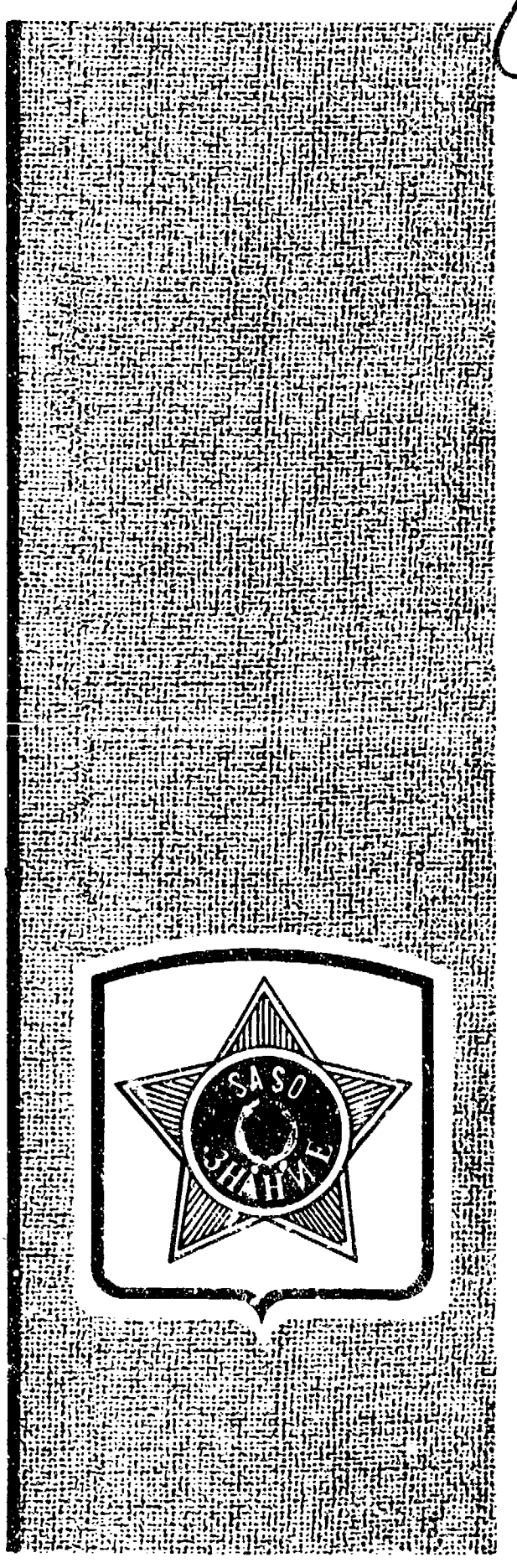
SOVIET ARTILLERY PLANNING

IN THE TACTICAL DEFENSE

SOVIET ARMY STUDIES OFFICE



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The Soviet view of future combat envisions a non-linear battlefield, requiring new force structure, new tactics and altered concepts of fire support. New, detailed tactics are being developed for a proposed combined-arms battalion. New fire support concepts are being developed for artillery and aviation. The reconnaissance-fire group and aviation/helicopter antitank group are two products of this effort. Mathematical planning aids have been developed to assist the Soviet battalion commander in forecasting battalion-level combat.

Non-linear combat, new tactics, combined-arms battalion, reconnaissance-fire group, mathematical model[redacted] aviation/helicopter antitank group

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SOVIET ARTILLERY PLANNING IN THE TACTICAL DEFENSE

by

LTC Lester W. Grau
Soviet Army Studies Office
U.S. Army Combined Arms Center
Fort Leavenworth, Kansas

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The views expressed here are those of the Soviet Army Studies Office. They should not necessarily be construed as validated threat doctrine.

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SOVIET ARTILLERY PLANNING IN THE TACTICAL DEFENSE

INTRODUCTION

Artillery has always held pride of place in the Imperial Russian and Soviet Armies. In Imperial Russia, artillery officers enjoyed a reputation for intellectual and professional excellence and received preference over the officers of other arms. Today, other nations structure armies around maneuver forces. The Soviets, due in part to their unique planning and employment of artillery, appear to have structured their army around artillery.[1]

Due to the perceived offensive nature of Soviet military planning since the 1920s, most Western analysts have studied Soviet artillery within the context of a Soviet offense.[2] Since the proclamation of the "Warsaw Pact Defensive Doctrine" in May 1987, the Soviet military has been reexamining the strategic, operational and tactical employment of its forces within the context of a "defensive doctrine". Subsequently, the quantity of articles on tactical defense has increased in Soviet military journals and books. These Soviet writings indicate that the Soviets have a comprehensive theoretical framework which encompasses both contemporary and future defensive tactical utilization of artillery.

TERMS AND CONCEPTS

Artillery missions: Artillery missions include annihilation, destruction, neutralization and harassment of a target. Missions are assigned depending on the nature of the target, overall mission, and type of target. The Soviets define these missions as follows:

> Annihilation [unichtozheniye] consists of inflicting such losses or damage on a target that it completely loses its combat effectiveness. In the annihilation of unobserved targets, fire is conducted until a designated number of shells is expended which assures a 70-90% kill probability of individual targets or the mathematical expectation of 50-60% of targets destroyed in a group target. (The implication is that the target is so damaged that it cannot be reconstituted and is incapable of even token resistance).
>
> Destruction/demolition [razrusheniye] consists of putting a target in an "unfit" condition. (The implication is that the target is so damaged that it cannot be reconstituted without a significant expenditure of time and resources, and is capable only of sporadic and uncoordinated resistance).

Neutralization/suppression [podavleniye] involves inflicting such losses on a target and creating such conditions by fire that it is temporarily deprived of its combat effectiveness, its maneuver is restricted or prohibited, or control is disrupted. In neutralizing an unobserved group target, the expenditure of a norm of rounds assures the mathematical expectation of 30% of the targets destroyed. (The implication is that the target is severely damaged, but would be capable of eventual coordinated resistance after the suppression fire is lifted).

Harassment [iznureniye] is accomplished by conducting harassing fire with a limited number of artillery pieces and a specified amount of ammunition within a prescribed time to exert moral-psychological pressure on enemy personnel in defensive positions or assembly areas, at control points, in rear installations, etc. (Firing platoons or batteries normally conduct harassing fire from temporary firing positions or positions previously occupied by a larger artillery force).[3]

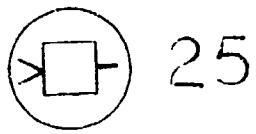
Classification of artillery fire: Artillery fire is further classified as fire against an individual target, fire concentration, standing barrage fire, rolling barrage fire, successive fire concentration, offensive rolling barrage and massed fire.[4] Normally, artillery planning is conducted in detail on maps which have been annotated with data acquired from reconnaissance and intelligence reports and topogeodetic surveys. The individual artillery classifications of types of fire are defined as follows:

Fire against an individual target is fire by a battery, firing-platoon or artillery piece conducted independently from indirect or direct fire positions. Individual targets are recoilless rifles, ATGM launchers, tanks, machine guns, dug-in or mobile armored personnel carriers, fixed or mobile observation posts, radar sites, permanent armored or concrete weapons emplacements, etc.

In firing from an indirect firing position, a battery may engage one or two targets simultaneously. When a battery engages two targets simultaneously, the battery commander controls the fires of one platoon while the headquarters platoon commander controls the fire of the other.

One or two guns are assigned for each target when annihilating armored targets or permanent weapon emplacements by direct fire.[5]

On the map, individual targets are circled and numbered as follows:[6]



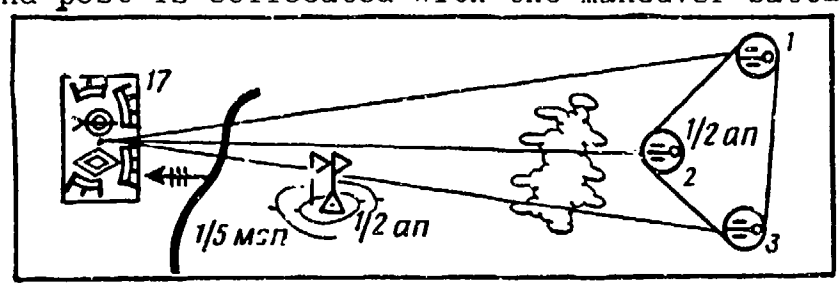
The circle and numbering are drawn in black while the enemy target is drawn in blue.[7]

Fire concentration [sosredotochennyy ogon' (hereafter SO)] is fire conducted by several batteries or battalions simultaneously against one target. Fire concentrations are used to destroy nuclear-capable tactical systems, personnel and weapons systems in strong points and assembly areas, command and observation posts, artillery and mortar batteries, subunit march columns, and other observed and unobserved targets.[8]

Fire concentrations are planned to provide even distribution of impacting rounds on the target area. On the map, fire concentrations are depicted by a black, numbered rectangle for cannon artillery 

and by a black, numbered square 

for multiple rocket launchers The fire concentration symbol on the planning map delineates the physical area of impact to scale.[9] The following illustration depicts a tube artillery battalion firing a concentration in support of an attacking maneuver battalion. As is normal, the artillery battalion command post is collocated with the maneuver battalion command post.[10]



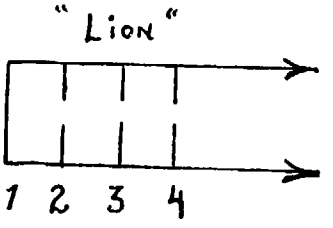
Standing barrage fire [nepodvizhnyy zagraditel'nyy ogon' (hereafter NZO)] is a solid curtain of fire set up along one line, while rolling barrage fire [podvizhnyy zagraditel'nyy ogon' (hereafter PZO)] fire is a solid curtain of fire set up on several lines in succession. Barrages are established on axes of attacking or counterattacking enemy mechanized infantry

and tanks to inflict damage, prevent their advance, disorganize enemy combat formations, and to create favorable conditions for their annihilation by antitank weapons.[11]

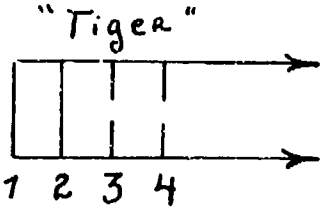
Barrage fire is planned on the most important armor axes and coordinated with antitank fires from company strong points. Barrage fires are observed and adjusted from observation or command/observation posts. They are conducted by howitzer and gun artillery. Commanders of companies, batteries and above may request standing barrage fire, while maneuver and artillery battalion commanders and above may request a defensive rolling barrage.

The defensive rolling barrage first (farthest) line is established approximately 2-4 kilometers from the forward edge of the main defense, at the distance which attacking enemy forces are expected to deploy from company into platoon columns. The final line is 700-1000 meters from the forward edge of the main defense. Depending on the terrain, the observation requirements, the expected speed of attacking tanks and personnel carriers (considering terrain), and the training of the gun crews, the distance between lines is 400-600 meters. The successive fire lines allow servicing artillery battalions to shift fires quickly from one line to the next.[12]

A defensive rolling barrage is planned on each armor axis and is named for a predatory animal such as "Lion", "Tiger", etc. Each line in the barrage is numbered beginning with the far line, such as "Lion-1", "Lion-2". Graphically, the defensive rolling barrage is depicted in black as follows:[13]



The fire plan may call for a dual defensive rolling barrage. In this case, lines 1 and 2 are fired simultaneously, and then shifted to successive lines. The graphic depiction of a dual defensive rolling barrage is drawn in black as follows:[14]



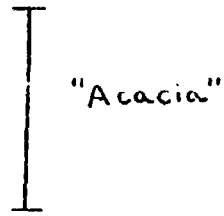
The width of an artillery battalion's rolling barrage depends on the number of guns in the battalion. Normally, no more than 25 meters per gun is allowed in planning the width.[15] Thus, an 18-gun battalion would have a width of no greater than 450 meters and a 24-gun battalion a width of no greater than 600 meters.

Rolling barrage fires are initiated at the moment lead enemy tanks approach the first (fartnest) line, and are conducted until the bulk of the tanks leave the impact area. The fires are then shifted to the next line. Fires at the final defensive rolling barrage line are continued after the attacking tanks have passed through the barrage in order to separate the accompanying mechanized or dismounted infantry from the tanks. Should the enemy deviate from the expected axis, adjustment of the barrage is made by the artillery battalion commander.[16]

Calculation of ammunition expenditure for a rolling barrage is based on the expected enemy deployment, and length and severity of the combat. Enemy tanks will probably deploy from company to platoon columns before moving into platoon line. A 5-tank platoon will have a depth of 150-200 meters. The tank column will cover this 150-200 meters in one minute if moving at 12-15 kilometers per hour. As the attacking tank platoon column moves through effective artillery fire at a barrage line, its advance should slow, thus increasing the platoon's exposure time to one and one-half minutes. Since the rates of fire for a 122-mm howitzer and a 152-mm howitzer are six and four rounds per minute respectively, a trained 122-mm howitzer crew can fire nine rounds and a trained 152-mm howitzer crew can fire six rounds per barrage line. Thus, an 18-gun 122-mm howitzer battalion will fire 162 rounds per barrage line, whereas an 18-gun 152-mm howitzer crew will fire 108 rounds per barrage line. Furthermore, a 24-gun 122-mm howitzer battalion will fire 216 rounds per barrage line, whereas a 24-gun 152-mm howitzer battalion will fire 144 rounds per line.[17]

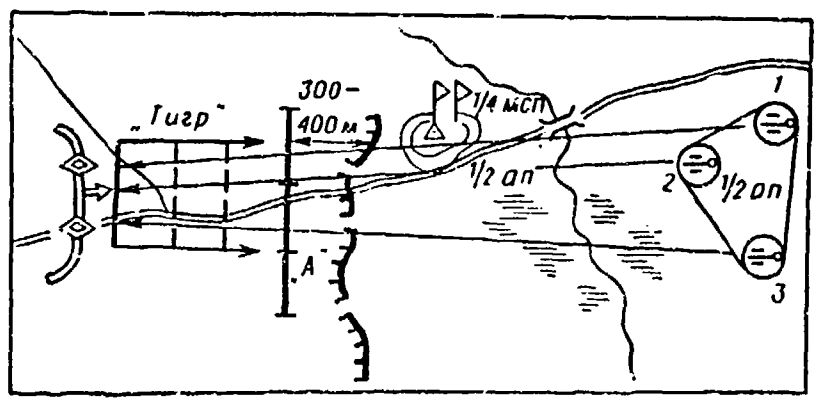
The standing barrage is used to repel an attack or counterattack by enemy tanks and troops directly in front of the main defense. A standing barrage is normally located no closer than 300 meters to Soviet troops in prepared positions and 400 meters from Soviet troops in the open. Each standing barrage line is named for a tree, such as "Acacia" or "Birch", and is denoted on fire planning maps by the initial letters of the names of the corresponding tree, such as "A", "B". The width of a standing barrage is wider than that of a rolling barrage, but no more than 50 meters per gun. Thus an 18-gun battalion could have a standing barrage of up to 900 meters, whereas a 24-gun battalion could have a standing barrage of up to 1200 meters.[18]

Graphically, the standing barrage is depicted in black as follows:[19]

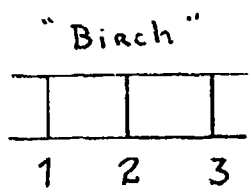


The Soviets do not plan standing barrages along tree lines, hill crests, trench lines or the outskirts of populated areas, because the approach of the enemy to these features will not always be detected and 60 to 70 seconds will pass from when the enemy is detected to when the first rounds impact on the standing barrage line. During that time, the enemy will have moved 120-150 meters past the feature. Consequently, Soviet fire planning establishes standing barrage lines 150-200 meters from tree lines, hill crests, trenches, and the outskirts of populated areas on the direction of the expected enemy attack.[20]

The following illustration shows a moving barrage which leads into a standing barrage. Both are fired by a single artillery battalion and the standing barrage is located the doctrinal distance of 300 meters from entrenched, protected defending troops or 400 meters from unprotected, defending troops. The battery sectors of the standing barrage line are readily identified.[21]



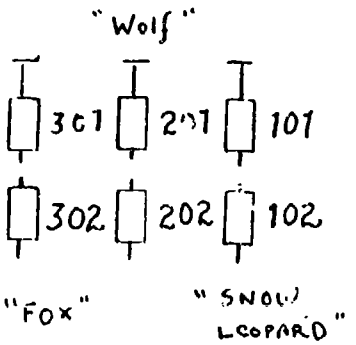
A standing barrage can also consist of more than one line. This deep standing barrage can be fired by a single battalion on a narrow approach (300 meters with an 18-gun battalion, 400 meters with a 24-gun battalion) or by several battalions on a regular approach. Graphically, the standing barrage is drawn in black as follows:[22]



The same rules for coding and marking the standing barrage apply to the deep standing barrage. All lines of the deep-standing barrage are fired simultaneously and continuously through the duration of the fire mission. Line 3 is located 300 or 400 meters from defending, friendly troops.

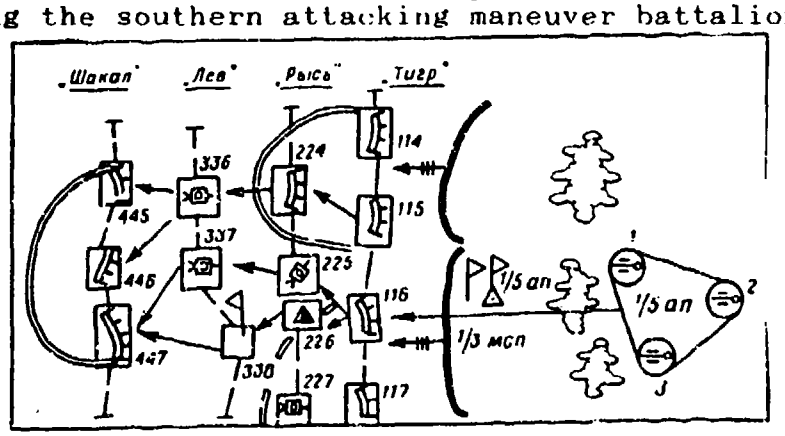
The successive fire concentration [posledovatel'noye sosredotocheniye ognya (hereafter PSO)] is used to support the attack or counterattack of motorized rifle and tank subunits and regiments. It can be fired on one, two or three lines simultaneously and is designed to neutralize enemy personnel and weapons to the front and on the flanks of the attacking/counter-attacking subunits. These lines of fire are shifted successively against targets in the enemy depth.[23]

Graphically, the successive fire concentration is depicted in black as follows:[24]



Planned targets are associated by lines with those targets located approximately the same distance from the friendly positions being grouped on the same line. Lines are named after predatory animals (as are rolling barrages) and can be 300 to 1000 meters apart. Targets on the lines are given three-digit numbers with the first number representing the line number and the other two digits the number of the target on that line. An artillery battalion will usually service two or three targets on a line.[25]

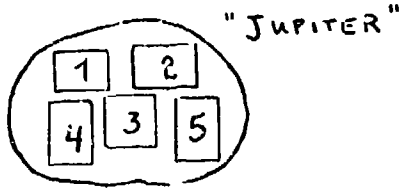
The following illustration depicts an artillery battalion supporting the southern attacking maneuver battalion:[26]



The artillery battalion services target 116 and then shifts to battery engagement of targets 225 and 226 (on line "Lynx"). When the fire is shifted to line "Lion", the battalion's batteries fire on targets 337 and 338. When the fire is shifted to line "Jackal", the entire battalion engages target 447.[27]

Massed fire is the concentration of all or the bulk of available artillery and other systems of division and army to destroy a grouping of forces or other enemy targets in a short period of time. Maneuver by fire is an important component of massed fire.[28] Since massed fires require significant amounts of artillery, they are seldom planned below division level.

Graphically, massed fires are depicted in black as follows:[29]



Fire concentrations are numbered within the grouping and the grouping is given a code name based on an astronomical body. The illustration shows a massed fire plan which is probably for a 5-battalion division artillery group (DAG). Targets 1, 2, 4 and 5 are cannon artillery concentrations while target 3 is a multiple rocket launcher battalion target.[30]

Other graphic control measures used in artillery fire planning are fire sector lines and fire sector contingency lines. The artillery fire sector line ←——————— is drawn in black and is used to depict the area of fire and planning responsibility for the artillery unit. The artillery fire sector contingency line ←—— —— —— is also drawn in black and is used to depict additional areas of fire and planning responsibility which may be assigned under certain contingencies.[31]

Protecting ones own troops from friendly artillery is an important planning factor. Charges are selected which provide minimum dispersion, mixed ammunition lots are not fired in the proximity of friendly troops, and fragmentation rounds are fired in lieu of HE in the vicinity of friendly troops. The following "danger close" safety norms are used for Soviet artillery planning:[32]

Friendly troops in the open or in unarmored vehicles.	500 meters from artillery within a 10-km radius or 700

	meters from artillery located more than 10 km away.
Dug in friendly troops or personnel in armored vehicles.	300 meters from artillery within a 10-km radius or 500 meters from artillery located more than 10 km away. Multiple rocket launcher fire cannot be planned any closer than 1,000 meters from friendly forces.
Dismounted attacking subunits.	400 meters.
Subunits attacking in BMPS or BTRs.	300 meters.
Subunits attacking in tanks.	200 meters.

ARTILLERY IN THE DEFENSE

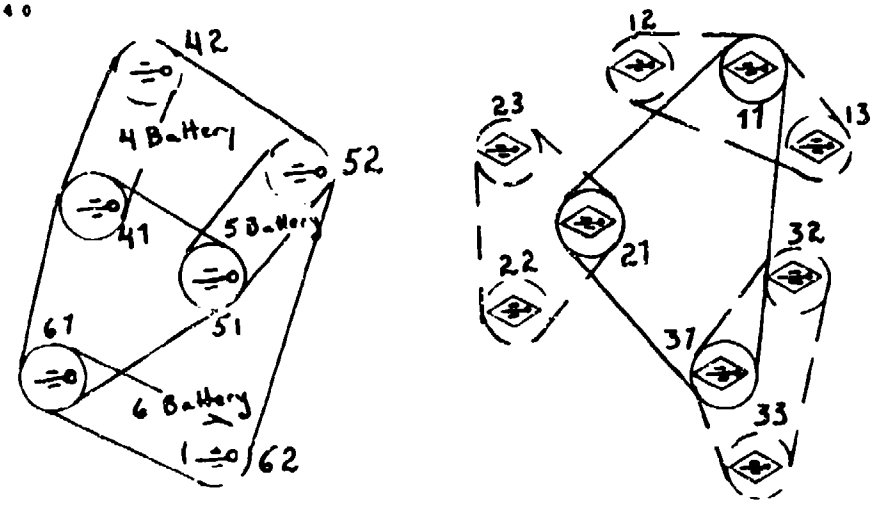
Artillery battalions are the basic unit of Soviet artillery planning and can be incorporated into regimental, division or army artillery groups; be assigned to reconnaissance-fire complexes or reconnaissance-fire groups; or be attached to or placed in support of a maneuver unit.[33] Commonly, a howitzer battalion is attached to or put in support of a maneuver battalion. Howitzer battalions are incorporated into regimental artillery groups (RAGs), while gun and multiple-rocket launcher battalions are incorporated into division artillery groups (DAGs). Army artillery groups (AAGs) are usually composed of all gun battalions or all multiple-rocket launcher battalions. Surface-to-surface missile battalions are not incorporated into artillery groups, but are placed in support of a division or army. Due to fire direction center (FDC) requirements and their limited ability to put a sufficient number of rounds on target fast enough, batteries seldom operate independently of artillery battalions in indirect fire.

In the defense, artillery battalions are more often placed in support of forward maneuver battalions.[34] An artillery battalion in the defense engages the enemy by fire in coordination with other weapons. Artillery missions include artillery counterpreparation and the four phases of defensive artillery fire planning: artillery denial of enemy movement and deployment, artillery repulsion of enemy attack, artillery support of defending troops in their own depth, and destruction of the enemy during counterattack.[35] Additional defensive artillery missions include: the support of maneuver forces in the security zone and at the forward position; covering gaps and

open flanks with fire; providing illumination to locate and dazzle the enemy and orient counterattacking friendly forces; and combatting airborne, seaborne and airmobile insertions.[36]

Gun and howitzer batteries are positioned astride armored axes of approach in order to employ their direct fire capability. In order to assist in their direct fire mission, firing position approaches are usually covered with antitank mines and firing positions are selected to provide 360-degree fields of fire and the capability to conduct major shifts from the base line. Mortar batteries and multiple rocket launcher batteries are located in areas inaccessible to tanks. Firing positions are located away from prominent features which would aid the enemy in registration. Intervals of 20-40 meters are maintained between guns, howitzers and mortars, while a 50-60 meter interval is maintained between multiple rocket launcher platforms.[37]

An artillery battalion has one primary and one or two alternate positions. A battalion may have a temporary firing position in the security zone, in defending a forward position, when conducting fire against distant targets or when acting as a roving battalion.[38] Each battery has a primary and one or two alternate positions in a battalion area. In addition, a battery may have a temporary firing position when serving as a roving battery or duty battery.[39] Batteries normally shift positions following a fire mission. The following sketches illustrate a battalion position with one and two alternate positions per battery:[40]



Artillery reconnaissance is conducted from the artillery battalion command/observation post and battery command/observation posts. Normally, the artillery battalion commander collocates himself and his command/observation post with the maneuver battalion command post. Battery commanders are often collocated with maneuver company commanders. The artillery battalion may also establish forward and lateral observation posts to provide complete observation. Additionally, the

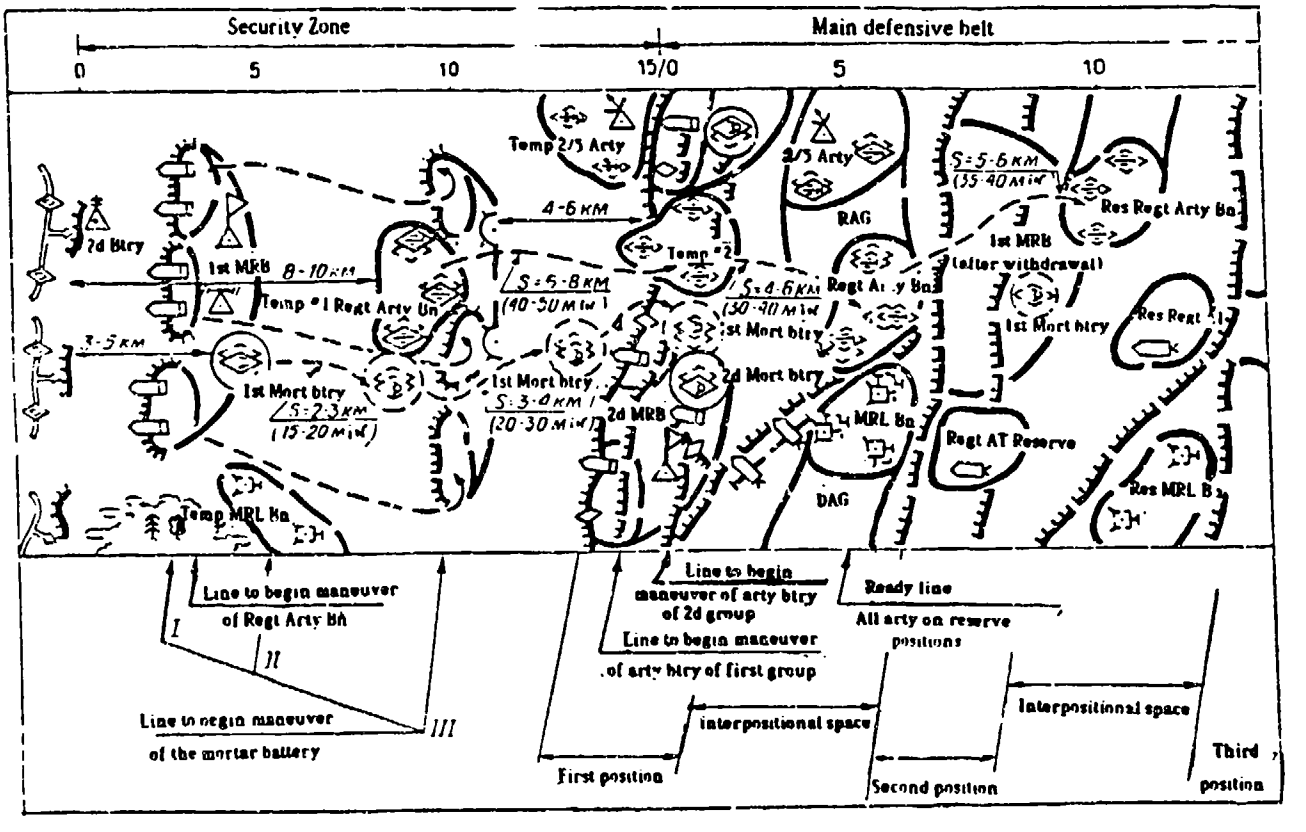
division artillery reconnaissance battery provides radar/radio and sound-ranging targeting intelligence to the artillery battalion.[41]

The artillery plan is always closely coordinated with those of higher and adjacent artillery units, the mortar battery (batteries) of the supported unit (units), and the direct fire plan of the supported unit. When necessary, the 100-mm T-12 antitank guns of the regimental and division antitank reserve can supplement the direct and indirect fires of Soviet artillery.

A thorough discussion of the artillery battalion planning process and troop leading procedures in the defense is attached as Annex A. Basic artillery planning data is attached as Annex B.

MANEUVER OF ARTILLERY IN THE DEFENSE

Maneuver of artillery in the defense involves more than shifting battery firing positions following fire missions. Artillery battalions and artillery groups have primary, temporary and reserve positions as well. The following figure illustrates the maneuver of a motorized rifle regiment's artillery battalion, a division's BM-21 multiple rocket launcher battalion, and a motorized rifle battalion's mortar battery in the security zone, in their primary positions and in their reserve positions.[42]



Security Zone

The figure shows a security zone with a 15-kilometer depth which is occupied by a motorized rifle battalion (with an organic self-propelled mortar battery), two self-propelled artillery battalions, a multiple rocket launcher battalion, a sound-ranging platoon, fire tracking radar, and ground observation radar.[43]

The security zone is usually occupied first by the artillery reconnaissance subunits mounted on the PRP-3 artillery reconnaissance vehicle (SMALL FRED), a command-post vehicle or a vehicle carrying the SNAR-10 radar. The reconnaissance subunit of a battery will be collocated with the combat security force, normally some 500 to 1500 meters in front of the security zone maneuver battalion position. In this case, the 2d battery has its battery CP/OP located forward with the combat security element in the upper left corner of the diagram. Other artillery reconnaissance is deployed in support of the security zone. The sound-ranging platoon and radar reconnaissance platoons are usually deployed four to six kilometers behind the forward edge of the security zone maneuver battalion's position.

Control and quartering parties precede the movement of the artillery and mortar subunits. In a normal, 15-km-deep security zone, a maneuver battalion will establish two or three defensive positions. In the same area, an attached or supporting artillery battalion will usually establish one (occasionally two) temporary firing positions. The position will normally be located 8-10 kilometers from the line of enemy contact. The artillery battalion will also usually establish a temporary firing position on the forward edge of the main defensive belt--often occupying the forward trenches. This position will be used to support the maneuver battalion in its forward (i.e. final) position in the security zone.

The maneuver battalion's organic mortar battery will normally establish 3-5 temporary firing positions within the security zone. The first position will be 3-5 kilometers from the forward edge of the security zone, while the last position in support of the security zone will be in the main defensive belt. All artillery and mortar batteries will have two or three firing positions (located 600-800 meters apart) within each temporary firing position. Thus, after firing a mission, the battery can rapidly displace to avoid enemy counter-battery fire. Efforts will be made to conduct fire missions with only part of the available artillery and mortars, since half of the indirect-fire assets must be prepared to fire at all times.[44] The artillery battalion commander or mortar battery commanders independently direct the shifting of firing batteries or platoons, but must consult with the maneuver battalion commander and higher artillery chief prior to displacing their commands from one temporary firing position to another.

A mortar battery in the security zone will normally establish temporary firing positions 2-3 kilometers apart and will displace by firing platoon (a 15-20-minute process). The first displacement normally begins when the enemy has penetrated the forward platoon position (a depth of 300-500 meters). The second firing platoon should begin to displace before the enemy has penetrated the forward company position (a depth of approximately 1000 meters), but does not displace prior to the first displacing platoon's being in its new position and ready to fire.

An artillery battalion can displace to another firing position by battery or all at once. If a maneuver battalion has an attached and a supporting artillery battalion, the attached artillery battalion will displace as an entire battalion. To displace by batteries under usual circumstances, an artillery battalion will need 30-40 minutes to displace 4-6 kilometers and 50-60 minutes to displace 8-10 kilometers.

As the security zone battle is fought and maneuver and indirect fire subunits are withdrawn, coordination and timing becomes crucial. Continuous, uninterrupted fire support must be available to the maneuver commander until he withdraws his unit from the forward position and into the main defensive belt. At that point, attached and supporting artillery battalions are also withdrawn and positioned for the main defensive position battle. The artillery battalions can again be attached to or in support of a maneuver battalion. They are often incorporated into artillery groups.

Main defensive belt

The preceding figure shows that the regimental artillery battalion withdraws from its security zone temporary firing position into a temporary position within the first defensive position of the main defensive belt. From there, it occupies its primary position within the RAG. The northern artillery battalion also occupies its primary position within the regimental artillery group, while the multiple rocket launcher battalion occupies its primary position in the DAG. Attached artillery battalions and organic mortar batteries are normally positioned 2-3 kilometers from the forward edge of the main defense, while supporting artillery is located 4-6 kilometers from the forward edge. Sound-ranging platoons and radar reconnaissance assets are located 4-6 kilometers from the forward edge. The RAG and DAG have reserve positions and the artillery battalions have reserve positions within them. The regiment and division antitank reserves have surveyed positions which support the overall defensive plan and are closely coordinated with the positioning of the RAG and DAG.

Should it be necessary to displace artillery battalions and mortar batteries from their primary positions, the preferred method is again to displace the entire unit simultaneously. However, should it become necessary to displace by batteries and firing platoons, the same constraints apply. To displace an artillery battalion 6-8 kilometers by batteries will require 40-50 minutes. During that period, an enemy attack should have penetrated two kilometers into the defensive position. Artillery and mortar support needs to be continuous during displacement. Should the displacement take more time than planned, forward artillery may become involved in the direct fire battle.[45] Should the enemy attack succeed and the artillery be forced back into reserve positions, the artillery will continue the fight and support counterattacks and the reduction of fire sacs by direct and indirect fire.

RECONNAISSANCE-FIRE GROUP

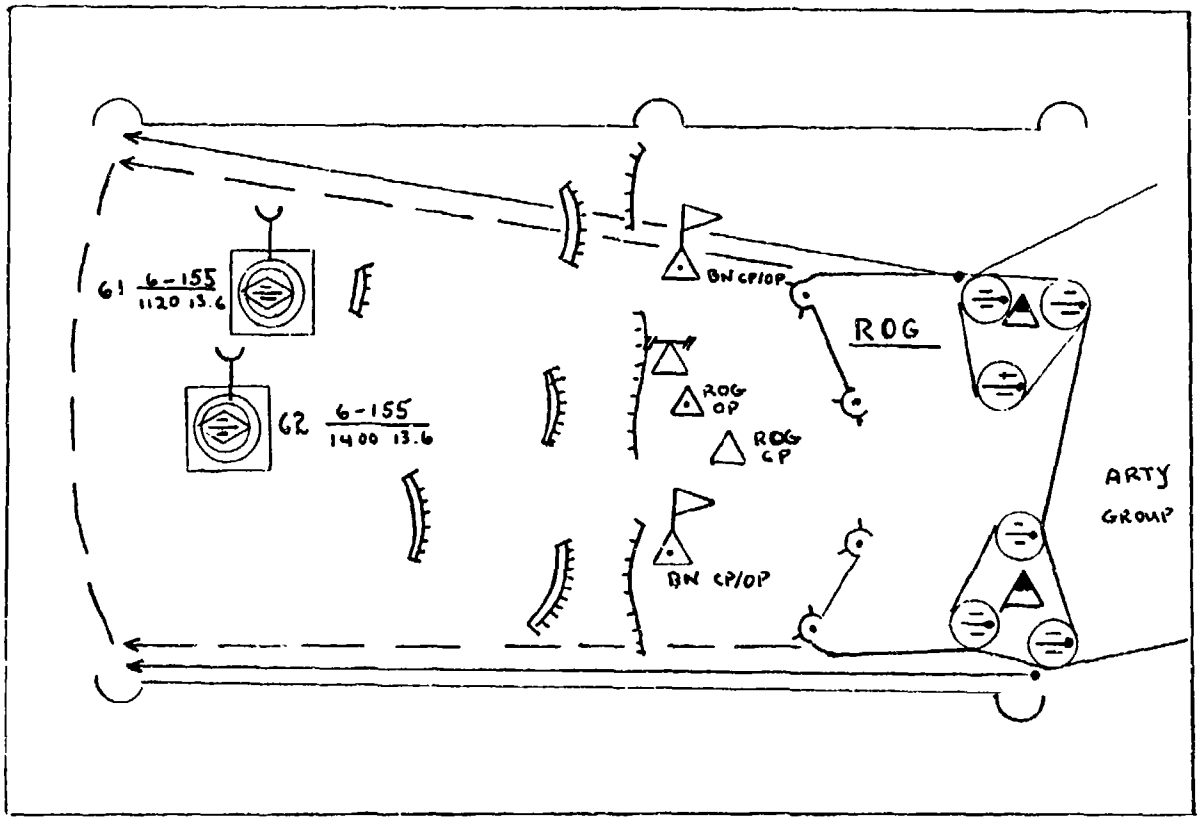
The Soviets have developed and fielded a first-generation reconnaissance-fire complex--a tactical range system which links a real-time reconnaissance/target designation/ vectoring system to an intelligence fusion center and a fire direction center. In turn, these are linked to dedicated, high-precision weaponry which can now destroy the target in near-real time. As the Soviets look to developing technology to improve their reconnaissance-fire complex, they have fielded a substitute using current technology which serves as a stop-gap reconnaissance fire complex. This substitute buys time and saves money while the next-generation reconnaissance fire complex is being developed.

This reconnaissance-fire group [razvedyavatel'no-ognevaya gruppa/ROG] links dedicated reconnaissance assets to a firing group headquarters and firing battalions to provide near real-time destruction of tactical targets.[46] It provides lower-level, responsive, decentralized artillery support coupled with a lower-level initiative.

The ROG consists of several artillery battalions, a dedicated artillery reconnaissance subunit, a group headquarters (and sometimes a helicopter for adjusting fire) and is constituted from an existing artillery group (normally a DAG or AAG) for the purpose of suppressing or destroying those particularly important enemy tactical targets which threaten friendly forces. These targets include tactical nuclear delivery means, self-propelled artillery and mortar batteries, FASCAM delivery systems, command posts, reconnaissance systems, combat helicopters located on aircraft carrier decks and others.

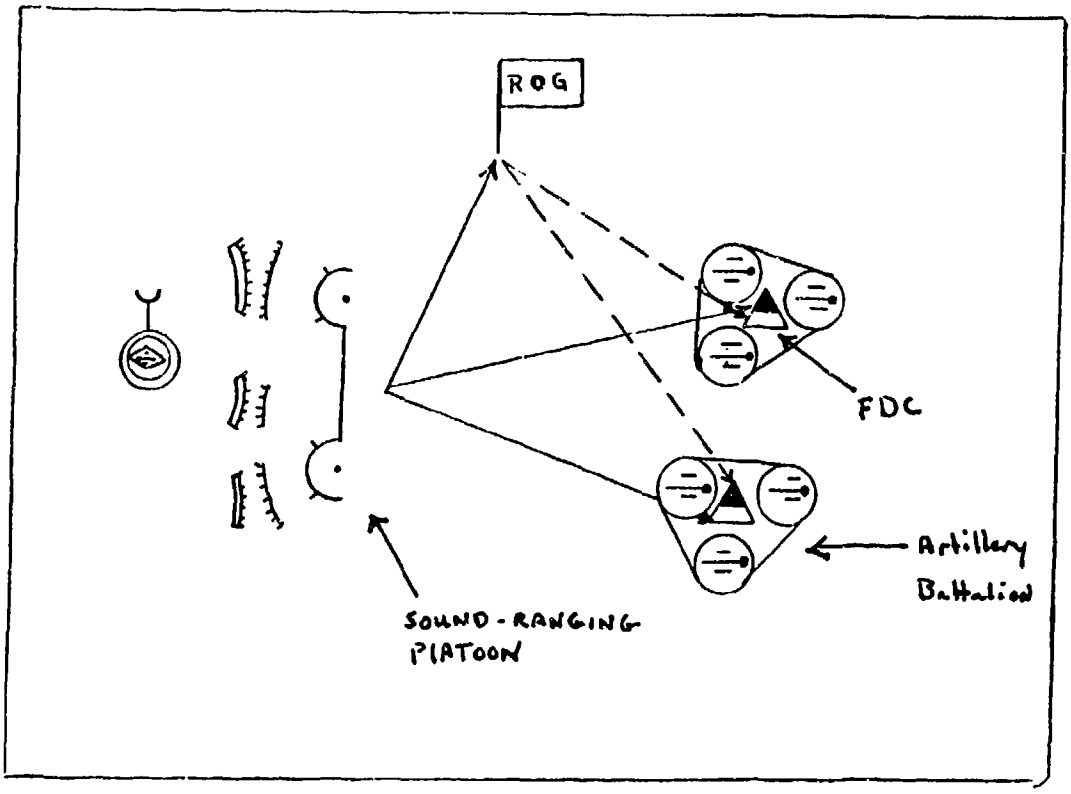
The ROG is constituted both in the offense and defense and is assigned a region or zone of fire responsibility in which it independently searches for and combats enemy targets. The

following illustration shows a two-battalion ROG with two dedicated sound-ranging platoons.



The ROG is part of a DAG and has a zone of responsibility which covers most of the division's sector to the depth of the capability of either the reconnaissance or artillery unit (in this case 20-25 kilometers). The division is defending. Each artillery battalion and the ROG headquarters has a forward observation post. An artillery radar surveillance unit is also working in sector in support of the DAG. Although not part of this particular ROG, the artillery radar surveillance unit can interface with the ROG to provide target information and fire adjustment. The sound-ranging platoons have discovered two batteries of 155-mm howitzers located at targets 61 and 62. They were discovered at 1120 and 1400 hours respectively.

This next illustration depicts the control sequence of the ROG:



A defending division has constituted a ROG and designated an artillery regiment headquarters as the ROG headquarters. A sound-ranging platoon, which is part of the two-howitzer-battalion ROG, locates an enemy howitzer unit and passes this information simultaneously to the ROG headquarters and the FDCs of the firing battalions (three solid lines). The FDCs begin computing firing data and pass this data to their batteries while the ROG commander decides independently whether to attack the target, when to attack the target, and whether to suppress or destroy the target. The ROG FDC and battalion FDCs compare firing data as it is determined. Once the ROG commander decides to attack the target, the fire mission is passed to the firing battalions and the sound ranging platoon (dashed lines). The sound-ranging platoon then adjusts fires as needed.

Should other targets be identified by senior artillery commanders, the ROG can suppress or destroy them. When the situation dictates, the elements of the ROG can rapidly reintegrate into the parent artillery group to conduct necessary fires.[47]

THE ROLE OF ARTILLERY IN FUTURE WAR

As the Soviets view the future battlefield, they envision war fought within the context of potential enemy use of tactical nuclear weapons and likely use of high-precision weapons (VTO). Combat will be high tempo, increasingly lethal and non-linear.

The meeting battle will be the primary form of combat and will require combined arms integration to the battalion level and below.[48]

Theater operations, using new, lethal, precise conventional weaponry and initial surprise/deception, must achieve their objectives rapidly before the enemy can deploy and utilize surviving nuclear or high-precision weapons. High-precision weapons include reconnaissance-strike and reconnaissance-fire complexes, automated fire control systems, antitank rocket systems, field artillery homing munitions, various guided missiles, radar seeking missiles, guided bombs and cassette munitions.[49]

The reconnaissance-strike and reconnaissance-fire complexes have figured prominently in Soviet writings on future war. The reconnaissance-strike complex (razvedyvatel'no-udarnyy kompleks/RUK) is the unified, automated system which provides support and combat employment of high-precision, long-range weapons. This system provides real-time reconnaissance, target designation, and vectoring to an intelligence fusion and fire direction center. The center provides guidance to dedicated high-precision weaponry which destroys the target in real or near-real time.[50] Reconnaissance strike complexes involve weapons systems which can function effectively at operational depths (surface-to-surface missiles and aircraft-delivered "smart" munitions) and are represented by such Western technology as "Assault Breaker", PLSS, JSTARS and JTACMS. The systems usually include four main interconnected components: an automated reconnaissance and guidance system, a mobile ground control center, the high-precision weapons and a system for precise determination of the locations of the system's components.[51]

The reconnaissance-fire complex (razvedyvatel'no-ognevoy kompleks/ROK) is a system similar to the reconnaissance-strike complex, but functions at tactical depths and employs artillery, multiple rocket launchers and short-range surface-to-surface missiles for target destruction.[52]

Due to the revolutionary expansion of the destructive capability of new weaponry, battle will be initiated at ever-greater ranges, forces and systems will need to disperse more and to be more mobile in order to survive, and maneuver forces will need to intermingle with enemy forces or to hug cities in order to avoid effective targeting.[53] The significant expansion of weapon ranges along with increased reconnaissance and rapid information processing capability have enhanced the capability of "defensive" systems to actively influence the battle long before ground forces come into physical contact. The ability of "defensive" systems to identify deep targets, reach out and destroy them has enabled the modern defense to assume many of the

advantages previously enjoyed only by the offense. These latest qualitative improvements enable the modern "defense" to achieve the same decisive objectives as the offensive.[54] Indeed, Soviet planners apparently believe that the distinction between the offense and defense is disappearing.

In this environment, the role of conventional artillery will increase. Artillery in quantity must be immediately available to seize fire superiority from the very beginning of the conflict.[55] With the revolutionary improvements in munitions, ordnance, reconnaissance and control systems, the Soviets will move from normative-based firing (which expends vast amounts of ammunition and creates a sizable logistics burden) to accurate, point-target engagements. The range of guns and mortars will increase to 30-40 kilometers. Conventional and nuclear projectiles will also increase in lethality. Multiple rocket launchers will fire fuel-air, remote-mining and antitank smart munitions. As these systems will be more mobile, they will be able to both fire at greater depths and service larger areas without having to physically incorporate into the presently employed, large artillery groups.[56] Improved, automated fire control systems will computerize the planning and control of artillery fires to allow effective fires separate from artillery groups and in support of non-linear combat.[57] Artillery will be re-integrated into maneuver battalions for this non-linear combat.[58]

With use of these new systems in a future war, the Soviet four phases of defensive artillery planning would still be operable. Only Phase One fires (to prevent enemy movement and deployment) would differ, as this phase could be initiated at much greater distances. Its goal would be to preempt attack by destroying high-precision weapons, headquarters, airfields, and electronic warfare systems. Enemy air assault, ground maneuver and forward deploying artillery systems could then be attacked (and perhaps defeated) prior to the ground forces coming into contact.

Such systems should be fielded in quantity within a decade in order to permit "the rapid destruction of subunits and units (i.e., battalions and regiments) as well as entire elements of the tactical and operational formations. In a short period of time, communications links and components, airfield take-off and landing strips, deep reserves and the like may be knocked out."[59]

In their artillery development, the Soviets may be focusing on revolutionary breakthroughs rather that on their historic tendency to accumulate ever-increasing quantities of artillery pieces. As General Lizichev pointed out

> the task is to ensure the transition from the 'evolutionary' path of system improvement (whereby the planned replacement for a generation of weaponry

contains only improvements of combat characteristics) to a path marked with qualitative leaps (whereby the weaponry acquires principally new combat capabilities).[60]

Clearly, artillery will continue to be the Soviet/Russian "god of war" in future conflict. There will be dramatic changes in fire direction procedures, artillery force structure, fire planning, logistics, and ground maneuver to accommodate the sweeping technological advances as artillery becomes an even more dominant part of Soviet warfighting.

CONCLUSION

Soviet defensive artillery fire planning is comprehensive, structured, and coherent. It differs from that of the West and is uniquely suited to Soviet war-fighting. It requires expenditure of significant quantities of ammunition to achieve "mathematically-proven" results, it routinely employs artillery in a direct-fire role to combat tanks, and it uses maneuver by fire to dominate territory. The maneuver plan is built around the firepower of artillery and aviation. Soviet artillery played a dominant role in World War II and later, in Afghanistan, it was used as a substitute for manpower. Soviet losses in both conflicts would probably have been much higher with a different artillery doctrine.[61]

Artillery holds pride of place in the Soviet ground forces and the state has put considerable effort into the development of artillery systems which are more accurate, shoot farther and shoot faster then the artillery systems of the West. Soviet FDC procedures have lagged behind those of the West, but as the Soviets prepare for the future, improved FDC procedures and equipment are being fielded. Indeed, the technological changes impacting on artillery will change their planning, techniques and procedures and make Soviet artillery an even more dominant force on the future battlefield. Current and future Soviet artillery systems and employment have many features that should be seriously studied in the West.

ENDNOTES

1. In 1986, the Soviets celebrated "600 Years of Patriotic Artillery" with a commemorative book--G. E. Peredel'skiy, Otechestvennaya artilleriya [Artillery of the Fatherland], (Moscow: Voyenizdat, 1986).

2. An excellent English-language Soviet artillery study which deals primarily with the offense is Chris Bellamy's Red God of War (London: Brassey's Defence Publishers, 1986).

3. G. E. Peredel'skiy & M. P. Pankov, Artilleriyskiy divizion v boyu [Artillery battalion in combat] (Moscow: Voyenizdat, 1989),

20-21.

4. A. A. Grechko, Sovetskaya voennaya entsiklopediya [Soviet military encyclopedia], Volume 2, (Moscow: Voyenizdat, 1976), 132.

5. Peredel'skiy, "Artilleriyskiy...", 20.

6. I. D. Pombrik & N. A. Shevchenko, Karta ofitsera [The officer's map] (Moscow: Voyenizdat, 1985), 162.

7. As a rule, the Soviets draw their tactical maneuver symbols (motorized rifle, tank, airborne, air assault and aviation) and aviation in red and their artillery, engineer, chemical, radio-electronic, signal, logistics and air defense symbols in black. All tactical enemy symbols are drawn in blue (see Ibid., 43). On operational and strategic level maps, this color scheme changes. All Soviet forces are then depicted in red, whereas various colors are used to depict allied and opposing forces. For example, in exercises in the Voroshilov Academy of the General Staff, US forces were green, FRG forces were brown, UK forces were blue, Belgian forces were violet, and Netherlands forces were purple. See Ghulam Dastagir Wardak, The Voroshilov Lectures: Volume 1, Issues of Soviet Military Strategy (Washington: National Defense University Press, 1989), 110.

8. Peredel'skiy, "Artilleriyskiy...", 25.

9. Pombrik, 162. However, the 1989 Peredelskiy, "Artilleriyskiy..." indicates that all fire concentrations are now indicated with a square. Current issues of Voyennyy vestnik [Military herald] are still using both the rectangle and square.

10. Peredel'skiy, "Artillerskiy...", 25.

11. Ibid., 21.

12. Ibid., 21-22.

13. Pombrik, 163.

14. Ibid.

15. Peredel'skiy, "Artilleriyskiy...", 20. The effective bursting radius of a 122-mm round against standing personnel is 40 meters by 20 meters, whereas the effective bursting radius of a 152-mm round against standing personnel is 43 meters by 22 meters. Thus, a 25-meter maximum width per piece will insure an effective barrage. See V. Ya. Lebedev, Spravochnik ofitsera nazemnoy artillerii [Field artillery officer's handbook] (Moscow: Voyenizdat, 1984), 258.

16. Peredel'skiy, "Artilleriyskiy...", 22-23.

17. Ibid., 23-24.

18. Ibid., 24.

19. Pombrik, 162.

20. Peredel'skiy, "Artilleriyskiy...", 24-25.

21. Ibid., 22

22. Pombrik, 162.

23. Peredel'skiy, "Artillerskiy...", 28-29.

24. Pombrik, 163.

25. Peredel'skiy, "Artillerskiy...", 28-30.

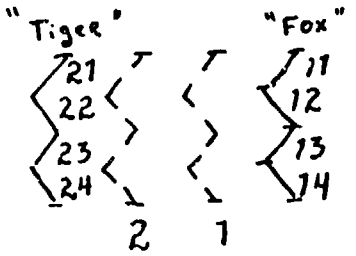
26. Ibid., 28.

27. While firing "Lynx" and "Lion", one battery each engages the two battalion targets on the line. One battery becomes the artillery battalion commanders "duty" battery and is used to engage targets of opportunity. A similar firing sequence is being conducted to the north and south of the depicted artillery battalion by other artillery battalions which are not shown.

28. A. M. Plekhov, Slovar' voennykh terminov [Dictionary of military terms] (Moscow: Voyenizdat, 1988), 154.

29. Pombrik, 164.

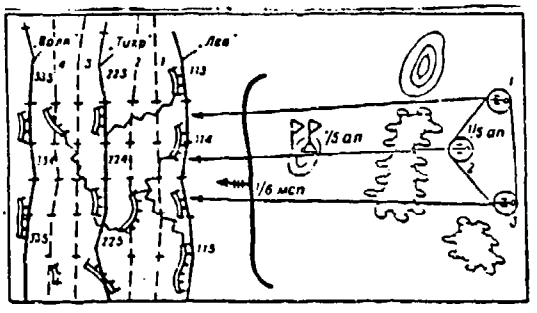
30. The offensive rolling barrage is the final classification of artillery fire, but as it has no defensive application, it is not included in the body of the paper. It is employed when the enemy defense has a dense network of trenches and connecting passages that hinders precisely determining the location of strong points and fighting through a fortified area. The offensive rolling barrage is a solid curtain of fire shifted ahead of attacking maneuver subunits to neutralize enemy personnel and weapons. One or two lines can be fired simultaneously. The first line is planned along the first trench of the enemy defense. Intermediate lines are planned to neutralize the enemy located between the primary lines and to prevent his maneuver along communications trenches. The distance between intermediate lines is 100 to 300 meters. Graphically, the offensive rolling barrage is depicted in black as follows:



The rolling barrage line is divided into battery sectors with not more than 15 meters of frontage per mortar or per gun of 100-mm caliber or smaller. No more than 25 meters of frontage per gun is allocated for each artillery piece larger than 100-mm. Primary lines are again named after predatory animals.

Fire is shifted from the primary line at the command of the motorized rifle or tank regimental commander as the attacking subunits reach the troop safety line. Fire is shifted from intermediate lines on the command of the artillery battalion commanders at the end of the prescribed time of fire, which is usually two to three minutes.

The following illustration from Peredelskiy shows a rolling barrage being conducted against a dense enemy trench network:



The battery sectors are clearly evident.

A double offensive rolling barrage is fired by two artillery groups. The first group conducts fire as described above while the second fires only against primary lines beginning with the second line.

See Peredel'skiy, "Artillerskiy....", 30-31; and Pombrik, 164.

31. Pombrik, 164.

32. Peredel'skiy, "Artilleriskiy...", 32.

33. Attached artillery (pridannaya artilleriya) is directly subordinated to the commander of the force to which it is attached. Attached artillery is normally exclusive and fires only those missions assigned by the force commander. (In an emergency, fire missions for a senior commander may be fired.) Supporting artillery (podderzhivayushchaya artilleriya) is under the command of the senior artillery commander and fires assigned missions established by the combined arms commander. Thus a supporting artillery battalion may be in support of several maneuver battalions, whereas an attached artillery battalion will fire exclusively for one maneuver battalion/regiment. Usually, a supporting artillery battalion will be in support of one specific

maneuver unit and will collocate its headquarters with that of the maneuver unit, but will take its firing mission from the senior artillery commander. V. Ya. Lebedev, Spravochnik ofitsera nazemnoy artillerii [Field artillery officer's handbook] (Moscow: Voyenizdat, 1984), 8. A. M. Plekhov, Slovar' voyennykh terminov [Dictionary of military terminology] (Moscow: Voyenizdat, 1989), 212 and 227.

34. Peredel'skiy, "Artilleriskiy...", 10-11.

35. Ibid., 191. Annex A covers artillery planning for the four phases in detail. It should be noted that defense at all levels incorporates counterattack/counterstrike/counteroffensive planning, a feature that should continue with the announced "defensive" doctrine.

36. A. T. Kirillov, V. P. Kuznetsov, V. I. Agafonov, Podgotovka ofitserov zapasa [Preparation of reserve officers] (Moscow, Voyenizdat, 1989), 249.

37. Peredel'skiy, "Artillerisky...", 18-19.

38. A discussion of artillery in the security zone, covering zone and forward position is contained in Lester W. Grau, "Defending Forward: Soviet Activities in Front of the Main Line of Defense", (Ft. Leavenworth, KS: Soviet Army Studies Office, 1990).

39. Peredel'skiy, "Artilleriskiy...", 194-195. The roving battery in a temporary firing position will use the battalion FDC and the battalion and battery observers.

40. Left hand sketch is Ibid., 204. Right hand sketch is Zygmunt Czarnotta, "Integration of Reconnaissance and Fire," Przeglad Wojsk Ladowych [Ground force review], May 1987, 25-32; translated in Harold S. Orenstein, Selected Translations From the Polish Military Press, Volume III: Supplement, (Ft. Leavenworth, KS: Soviet Army Studies Office, 1988), 38.

41. Kirillov, 250.

42. A. Khodakov, "O manevre artillerii v oborone" [Maneuvering artillery in the defense], VV (July 1990), 33-36.

43. Besides the self-propelled mortars at motorized-rifle battalion level, there are some other interesting symbols in this illustration. The self-propelled artillery battalion symbol depicts a gun, not a howitzer battalion but the text indicates that it is the organic, regimental artillery battalion. Currently, this is a 122-mm howitzer battalion.

44. During phase 2 fires, all indirect-fire assets will fire their moving and standing barrages. Half of these assets cannot be shifted immediately following the phase 2 fire missions.

45. This situation demonstrates the need for independent FDC capability at battery level, since it would advantageous to start the main defensive battle with the artillery battalion split into two locations.

46. This entire discussion of the ROG is based on Czarnotta. The Polish grupa rozpoznawczo-ogniowa/GRO has been translated into Russian as razvedyvatel'no-ognevaya gruppa/ROG and treated as a Soviet concept. The Polish open military press has historically discussed Warsaw Pact concepts well in advance of the Soviet open military press (as was the case with the OMG). The ROG has historical roots in the Soviet fire group of the 1930s. This article provides a detailed description of the training of artillery battalions to function within a ROG.

47. In the offense, the ROG will usually reintegrate into the DAG or AAG for Phase 2 (fire preparation) fires. In the defense, the ROG will usually reintegrate for Phase 2 fires and could remain as part of the artillery group for Phase 3 and 4 fires.

48. For a discussion of the Soviet development of combined arms integration at the battalion level, see Lester W. Grau, "The Soviet Combined Arms Battalion--Reorganization for Tactical Flexibility", (Ft. Leavenworth, KS: Soviet Army Studies Office, 1989) and Lester W. Grau, "Reorganizing for Battalion-Level Combat", Military Review, Volume LXIX, No. 12, (December 1 89), 65-72.

49. V. G. Reznichenko, et al., Taktika [Tactics], 2d edition, (Moscow: Voyenizdat, 1987), 24.

50. "Razvedivatel'no-udarnyy kompleks" [Reconnaissance-strike complex], Voyennyy entsiklopedicheskiy slovar' [Military encyclopedic dictionary], 2d edition (Moscow, Voyenizdat, 1986), 616-617.

51. Reznichenko, 24-26.

52. For an in-depth discussion, see Milan Vego, "Recce-strike Complexes in Soviet Theory and Practice", (Ft. Leavenworth, KS: Soviet Army Studies Office, 1989).

53. Harold S. Orenstein, "Warsaw Pact Views on Trends in Ground Forces Tactics", International Defense Review, September 1989, 1149-1152.

54. Christopher Bellamy, "Budushchaya voyna: The Russian and Soviet View of the Military-Technical Character of Future War",

Part Two (draft), (Texas A&M University: Center for Strategic Technology, 1990), 32.

55. G. E. Salmanov, "Sovetskaya voennaya doktrina i nekotoryye vzglyady na kharakter voyny v zashchitu sotsializma" [Soviet military doctrine and several views on the nature of war in the defense of socialism], Voyennaya mysl' [Military thought], December 1988, 10.

56. Teofil Wojcik, Rozwazania o wspolczesnym natarciu [Reflections on the modern offensive], (Polish Ministry of Defense Publications, 1987), 242 unpublished translation by Harold Orenstein, Soviet Army Studies Office.

57. Reznichenko, 25.

58. Grau, "The Soviet Combined Arms Battalion", 29-30.

59. Salmanov, 11.

60. A. Lizichev, "Armiya: Razgovor o nasushchnom" [The army: A conversation about the essential], Kommunist, No. 3, February 1989, 17-18.

61. Although, the Soviets may have done "better" in Afghanistan if they had shown more of a political willingness to accept casualties and close with the enemy. Artillery and aviation cannot win battles by themselves.

ANNEX A: ARTILLERY PLANNING IN THE DEFENSE -- "Tactical Example 3" from G. E. Peredelskiy and M. P. Pankov, Artilleriyskiy divizion v boyu [Artillery battalion in combat], (Moscow: Voyenizdat, 1989), pp. 199 - 222 as translated by LTC Lester W. Grau, Soviet Army Studies Office.

Our units, having penetrated the enemy main defensive region, have been developing the offensive for two days.

The 2d battalion, 8th Motorized Rifle Regiment with a tank battalion (minus a tank company) and 2d battalion, 5th Artillery Regiment, were advancing in the first echelon of the regiment in the direction of axis Zhuchki -- Veshki. The battalion was given the mission of first destroying the enemy, which was attempting to organize a defense on the high ground in front of Veshki, and then seizing Veshki.

At 1710 hours on 26 April, the battalion was deployed in prebattle formation when it met determined resistance by subunits of the withdrawing enemy along the line defined by hill 117.3 and the precipice. The first echelon companies deployed into combat formation, and conducted a fire fight but were unable to advance any further.

The 2d Artillery Battalion moved in march column. The battalion commander was collocated with the commander of the 2d Motorized Rifle Battalion, while the battery commanders were collocated with the company commanders of the companies they supported (4th Battery Commander with the 4th Motorized Rifle Company and 6th Battery Commander with the 5th Motorized Rifle Company), while 5th battery was stand-by battery. The subunits had 80% of their HE-fragmentation artillery ammunition units of fire.[1] In previous combat, the subunits had suffered losses--4th battery, two howitzers and 5th battery a single howitzer.

DEFEATING THE COUNTERATTACK OF A STRONGER ENEMY

At 1920 hours on the 26th of April, the commander of the 2d Motorized Rifle Battalion (MRB) announced his decision, which was based on a mission he had received. From this, the 2d Artillery Battalion commander understood that:

--various reconnaissance means established that a strong enemy reserve was concentrated in the vicinity of Gusevo, 15 kilometers northwest of hill 117.3. The enemy counterattack was expected along the axis Veshki -- Zhuchki in two to three hours or at dawn of the following morning.

--2d Motorized Rifle Battalion with its attached subunits, as part of the regiment, was to fortify the present line, organize fire coordination and defeat the counterattack of a superior enemy. The battalion would defend in a single echelon with 4th Motorized Rifle Company on the right, 5th Motorized Rifle Company on the left and 6th Motorized Rifle Company in reserve. The 2d Artillery Battalion would deploy into the combat formation and prepare fires to defeat the counterattack, and to cover the [maneuver] battalion's right flank.

EVENTS BY TIME
19 20 26 4
7 30 27 4
10 20 27 4
1 MRR
Zhuchki
4th MRR
Acacia
117.3
Birch
4th MRC
5th MRC
118.4
1 MRR
6th MRC
1 MRB
Ivoriki
Cherry
121.4
3d MRR
Hvena
Lemnaya
Veshky
Vysokaya
82
80
Gusevo
Lemnoe

MAP 1

--on the right at a distance of 2 to 2.5 kilometers, the subunits of the 15th Motorized Rifle Regiment were digging in (not shown).

--the 3d Motorized Rifle Battalion, having destroyed an encircled group of the enemy, was digging in along the line defined by the bushes and the swamp (not shown).

--The antitank reserve deployed on line as shown on the map.

On the basis of the decision of the 2d Motorized Rifle Battalion commander, the artillery battalion commander deployed his battalion into a combat formation. From the order of the Regimental Artillery Group commander, the artillery battalion commander knew that he had to prepare the following fires in preparation for defeat of the enemy counterattack:

Fire concentration 80: x axis 42810, y axis 74650.
Fire concentration 82: x axis 43640, y axis 75550.
Defensive Rolling Barrage "Hyena":
"Hyena 1" Right boundary: x axis 43860, y axis 76720.
Left boundary: x axis 43270, y axis 76610.
"Hyena 2" Right boundary: x axis 43615, y axis 77575.
Left boundary: x axis 43160, y axis 77310.
"Hyena 3" Right boundary: x axis 43460, y axis 78170.
Left boundary: x axis 43010, y axis 77840.[2]

Additional preplanned fires were left to the discretion of the artillery battalion commander.

In the event of an enemy night counterattack, the battalion will prepare to fire an illumination mission along the line Hill 117.3--"Vysokaya".

Be prepared to fire by 2000 hours 26 April. By 2100 hours, 30% of a unit of fire of HE-fragmentation rounds and 10% of a unit of fire of illumination rounds will be at the firing positions.

The 1st artillery battalion would prepare the following additional fires in the 2d Motorized Rifle Battalion sector:

Fire concentration 81: x axis 42280, y axis 74310:
Fire concentration 83: x axis 42340, y axis 75670:

and an extension of the defensive rolling barrage "Hyena" to the left of the 2d Artillery Battalion's sector.

The 2d Artillery Battalion commander decided:

1. To retain the present battery assignment for the support of the motorized rifle companies.

2. To utilize all the batteries to fulfill the fire missions assigned by the commander of the regimental artillery group; to prepare the batteries to fire additional concentrations 80 and 82; to prepare all batteries to fire standing barrage "Birch" to repel the enemy counterattack and "Acacia" and "Cherry" to cover the flanks; to prepare the 5th and 6th batteries to fire additional fire concentration 71 on height 121.4, which will destroy the enemy at the juncture of the 2d and 3d Motorized Rifle Battalions; to assign the 2d platoon of the 5th battery to fire the illumination mission along the line defined by height 117.3--"Vysokaya".

3. To assign reconnaissance missions to the chief of

reconnaissance and the battery commanders for reconnaissance of the enemy at their current line and to disclose in a timely manner their transition to the counterattack.

4. To assign missions to the chief of staff concerning preparation for battalion firing; organization for self-defense of the firing platoons in the event of a breakthrough of enemy tanks in the vicinity of the firing positions; the coordination of the actions of the 6th battery with the antitank reserve; equitable distribution of ammunition stores being brought forward to the batteries, and dispatch of illumination rounds to the 5th battery.

5. To give the instructions for the preparation of the subunits for night combat.

In accordance with his adopted decision, the 2d Artillery Battalion commander gave instructions and commands to his subordinates.

During the course of the daylight hours of 26 April and during the following night, the subunits of the motorized rifle and artillery battalions completed those measures necessary to repulse the counterattack, conducted reconnaissance, constructed fighting positions and replenished their ammunition. The artillery battalion commander periodically provided illumination fires in support of reconnaissance.

Enemy aviation conducted reconnaissance flights over our positions.

At daybreak (0530) on 27 April, enemy artillery began an artillery strike, and during the artillery fires, enemy tanks and IFVs approached the forward edge of our defenses. Simultaneously, his aviation bombed the reserve (second echelon), the headquarters of both battalions and other points in our defense.

The chief of reconnaissance reported, "From checkpoint 4, right 30 meters, six-plus tanks."

The 2d Artillery Battalion commander issued the commands "Stone", "Hyena-1" "Repeat", and after a minute and one-half, "Fire".

On the right and the left, various artillery and mortar subunits opened fire. Simultaneously, the enemy continued heavy artillery fire on the positions of our motorized rile and tank subunits.

Enemy tanks continued to advance and the artillery battalion commander shifted fires from the first line of moving barrage Hyena to the second and then the third.

The motorized rifle battalion commander used all his tank, BMP, ATGM and other weapons systems to repulse the enemy counterattack. A stubborn battle arose as the dismounted enemy infantry approached. Six tanks were knocked out, of which two were set on fire.

By 0730, 27 April, as a result of bitter fighting, the enemy succeeded in driving a wedge into our defensive formation (see Map 1). During the battle, the antitank reserve and the 6th battery firing in direct fire participated in the destruction of

enemy armor.

The commander of the 2d Artillery Battalion learned from the commander of the 2d Motorized Rifle Battalion that the neighboring unit on the right had been penetrated by the enemy counterattack to a depth of three to three and one-half kilometers. On the juncture between the 2d and 3d Motorized Rifle Battalions, up to a reinforced enemy tank company had developed its counterattack to breakthrough to the village of Dvoriki.

With the intent of preventing the further development of the enemy breach and destroying the penetrating enemy forces wedged into the 2d battalion position, the regiment planned to launch its own counterattack at 0820, 27 April, using the second echelon battalion (the 1st Motorized Rifle Battalion). After a seven-minute artillery strike, the counter-counterattack would begin at a line defined by Hill 118.4 and the road junction and advance in the direction of the road and Hill 121.4.

The commander of the RAG had sent the following message: "'Stone', attention. Fire strike of 7-minute duration. Be prepared by 0810. Suppress fire concentration 76--dug-in infantry. X axis: 41155, y axis: 78140, altitude 121. 250 X 200. Expend 1/4 of the norm. I am 'Rayon'."

The artillery battalion commander sent the following order: " 'Spring' (4th battery), 'Vichuga' (5th battery). Attention. Fire strike of 7-minute duration. Be prepared by 0810. Suppress fire concentration 76--dug-in infantry. X axis: 41155, y axis: 78140, altitude 121. 250 x 200 meters. Two structures. Expend 126 rounds per battery. I am 'Stone'."

At the appointed time, the 2d Artillery Battalion opened fire. Simultaneously, the 1st Artillery Battalion began to suppress targets. At the end of the fire strike, the 1st Motorized Rifle Battalion began its counterattack. A strong fire exchange arose. The 1st Motorized Rifle Battalion slowly began to move in the direction of Hill 121.4.

By 1020, the subunits of the 1st Motorized Rifle Battalion, supported by the 1st and 2d Artillery Battalions, the regimental antitank reserve and the mortar battery of the 2d Motorized Rifle Battalion, closed with the enemy but were unable to seize Hill 121.4. As a result of the counterattack by strong enemy forces and its repulsion by our forces, both sides suffered heavy casualties.

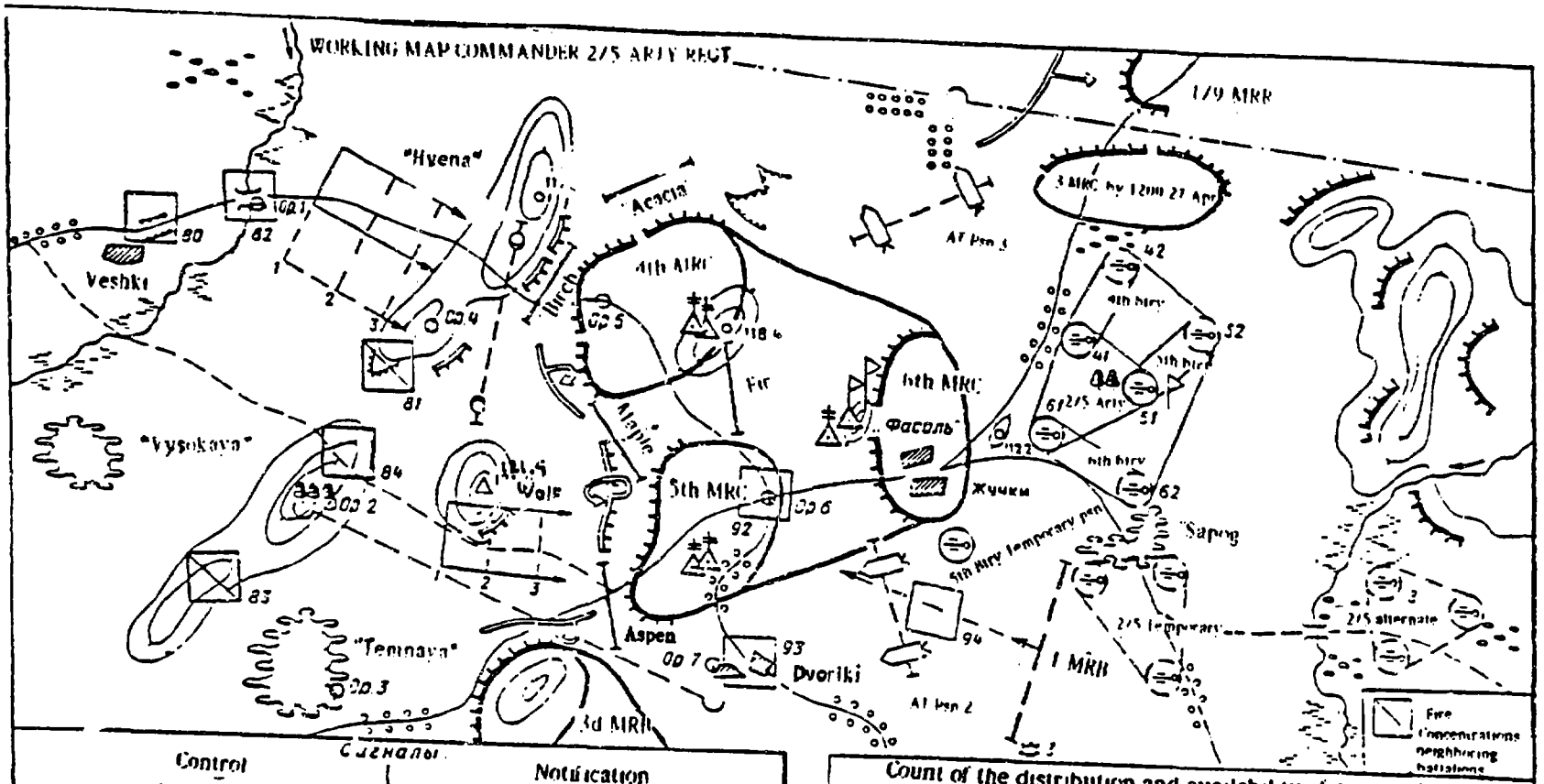
The 2d Artillery Battalion commander received this report from his chief of staff: "The 6th battery knocked out three tanks and lost two howitzers. Thirty percent of a unit of fire remains in the batteries."

The fire fight for the disputed line continued.

ORGANIZATION OF COMBAT ACTION DURING THE TRANSITION TO THE DEFENSE

By 1200 on 27 April, the 2d Artillery Battalion commander extracted the following important facts from the mission of the

Map 2



Control	Notification
Call for fire--Series of green rockets Cease fire--"Stop" Move to a different firing position--"Motor"	Radioactive contamination--Radioactive danger" Enemy air attack--"Air"

Call signs for stations and key personnel

Station	Call Sign	Person	Call sign
RAG OP	"Kayon"	Commander	20
RAG CP	"Happy"	Deputy Commander	33
275 Arty CP/OP	"Stone"	Deputy Commander for Political Affairs	35
FDC	"Belt"	Chief of Staff	38

Count of the distribution and availability of ammunition

Distribution, receipt and availability of ammunition		4th battery	5th battery	6th battery
Apportionment for a day of combat		704	880	704
On hand at 1200 27 April		96	120	96
For receipt by the start of battle by 2300 27		448	560	448
Guaranteed by the start of battle		544	680	544
Stacked on the ground at the firing positions		320	400	320
For ..	Delivery			
	Distribution			
	On hand			

Commander 275 Artillery

Major A Vinogradov

2d Motorized Rifle Battalion commander: the enemy, as a result of his counterattack in superior strength succeeded in wedging into parts of our defenses. The 9th Motorized Rifle Regiment (our neighbor on the right) is still experiencing active combat. After regrouping, the enemy is expected to continue his attack. A new enemy reserve is located some 30 to 35 kilometers west of hill 117.3. This reserve is moving in two columns of tanks, IFVs and artillery. The columns extend some 12-15 kilometers in length. An enemy offensive is possible during the morning of 28 April.

The 2d Motorized Rifle Battalion reinforced with a tank battalion (minus one tank company) and the 2d battalion, 5th Artillery Regiment are to defend as part of the regiment in the area defined by the gully, Dvoriki and Zhuchki, with the mission to prevent an enemy breakthrough and advance on the axis Hill 117.3--Zhuchki and the axis "Temnaya" grove--Zhuchki. The defensive sector is to be occupied by 2200 on 27 April. The relief in place of the 1st Motorized Rifle Battalion is to be accomplished between 2100 and 2200 hours. The defense is to be prepared by 0600 on 28 April.

The defensive decision will be announced at 1300 hours.

The 1st battalion, 9th Motorized Rifle Regiment defends on the right while the 3d battalion defends on the left. Boundaries between the two are shown on the planning map (Map 2).

At 1230 on 27 April, the 2d Artillery Battalion commander received the combat warning order from the regimental artillery group (RAG) commander. The warning order disclosed the following:

the 2d battalion, 8th Motorized Rifle Regiment was defending as part of the first echelon of the regimental defense.

the 2d battalion, 5th Artillery Regiment was part of the RAG and placed in support of the 2/8 Motorized Rifle Regiment.

The artillery battalion missions include:

--during the artillery denial of the movement and deployment of enemy forces, be prepared to defeat his columns by executing fire concentrations (SO) 80, 82, and 84.

--during the artillery repulsion of the enemy attack, be prepared to inflict destruction on the attacking enemy by executing moving barrages (PZO) "Hyena 1, 2, 3" and "Wolf 1, 2, 3" and standing barrages (NZO) "Acacia", "Birch", "Maple", and "Aspen".

--during the artillery support of the defending force in its depth, be prepared to inflict destruction on the penetrating enemy by executing fire concentrations (SO) 92 and 93 and standing barrage (NZO) "Fir".

--during the fire destruction of the enemy in support of the counterattack by the second echelon of the 8th Motorized Rifle Regiment, be prepared to execute a ten-minute fire strike on fire concentrations (SO) 94, 92 and 93.

The primary firing position for the battalion is bounded by the bushes, hill 112.2, and "Sapog" grove. The alternate firing position is as indicated on the map. The location of a temporary

firing position for the duty battery is at the artillery battalion commander's discretion.

Base line of fire is 53-00.[3]

Be prepared to conduct fire missions from the primary firing position by 2230, 27 April.

Ammunition expenditure during battle: Before enemy transition into the offensive--0.2 units of fire; after the enemy transition to the offensive--2.2 units of fire. The latter is broken down into the artillery denial of the movement and deployment of enemy forces--0.3 units of fire; the artillery repulsion of the enemy attack--0.7 units of fire; the artillery support of the defending force in its depth--0.7 units of fire; and the fire destruction of the enemy in support of the counterattack--0.5 units of fire.

By 2300, 27 April 1.4 units of fire will be delivered to each battery firing position. The remaining ammunition will be delivered by 0600 on 28 April. The RAG commander will determine when firing from the primary firing position against the advancing enemy will begin.

The artillery battalion commander plotted the fire missions on his working map. Then, based on clarification of the maneuver battalion's mission by its commander, he elaborated:

The 2d Motorized Rifle Battalion is defending with the bulk of its forces on the axis Veshki--Zhuchki. Stability of the battalion defense depends on holding the line of Hill 118.4, the road junction and Zhuchki.

The battalion is deployed in two echelons with the 4th and 5th Motorized Rifle Companies in the first echelon and the 6th Motorized Rifle Company in the second echelon. A tank company and the mortar battery are directly subordinate to the motorized rifle battalion commander. The battalion defenses include 3 company strong points, antitank positions and the firing position for the mortar battery.

Organic and attached weapons systems will be used for the destruction of the enemy during the movement and deployment of enemy forces on the axis Veshki-hill 118.4 and axis "Temnaya" grove--Zhuchki. The artillery and mortar subunits will support this by firing concentrations (SO) and moving barrages (NZO). During the repulsion of the attacking enemy by artillery and mortar subunits with moving barrages(PZO), the motorized rifle companies will fire preplanned direct fire concentrations on axes: Hill 117.3--Hill 118.4, Hill 121.4--Hill 118.4, Hill 121.4--Dvoriki. Antitank fire will be prepared on all these axes. In the event of enemy penetration into the battalion defense, all artillery subunits, motorized rifle companies and antitank weapons will destroy the enemy.

Combat missions of the subunits:

4th Motorized Rifle Company with a tank platoon defends its strongpoint (see Map 2) to deny an enemy breakthrough on the axis Hill 117.3--Hill 118.4. Secure the right flank of the battalion with the fires of a motorized rifle platoon and the company's machine guns.

CALCULATION OF TIME

It is now 1230, 27 April. Be prepared to open fire in the new firing position by 2330, 27 April. This leaves 11 hours, 8 of which are daylight.

№ п/п	Measures	Time
1	Familiarization with decision by Bn Cdr	13.00—13.20 27.4
2	Instruction to COS and Chief Bn Recon	13.30—13.40
3	Instructions for preparing the subunits for their new mission	13.50—14.00
4	Estimate of the situation & making the decision. Preparation of BN Cdr s report	14.00—15.20
5	Participate in Cdr's recon & coordination with Cdr, 2d MRB	From15.30
6	Give the mission to battery cdrs on site	16.30—17.30
7	Plan battalion combat action	15.30—22.00
8	Selection & topogeodetic verification of primary and temporary firing positions and CP/OP location.	15.00—20.00
9	Installation of wire communications	19.00—21.30
10	Digging in CP/OP, primary and temporary firing positions.	From 19.00— 27.4 to 6.00 28.4
11	Delivery of ammunition & preparation of ammunition for firing.	,TO 6.00
12	Refueling vehicles with POL	,To 21.00 27.4
13	Displacement of firing platoons (by battery)	22.00—23.30
14	Supervision of battery preparations	from 4.00 to 6.00 28.4
15	Report on readiness for combat	6.00 28.4

Table 1

5th Motorized Rifle Company with a tank company (minus one platoon) defends its strongpoint (see Map 2) to deny an enemy breakthrough on the axis "Temnaya" grove--Zhuchki. Secure the gap with the 3d Motorized Rifle Battalion with the fires of a motorized rifle platoon.

6th Motorized Rifle Company is the second echelon and defends its strongpoint (see Map 2). Be prepared to strengthen defenses on axis Hill 121.4--Zhuchki and to conduct a counterattack from the line defined by the base of Hill 118.4 to the outskirts of Zhuchki on the axes defined by the bushes--Hill 121.4.

The remaining tank company is directly subordinate to the battalion commander. Take up positions in the area of the road junction and be prepared to reinforce the antitank fires of the first echelon from your initial positions and from a line 500 meters north of the road junction.

The 2/5 Artillery and the mortar battery are to deny enemy movement and deployment on the axis Veshki--Zhuchki; inflict destruction on the attacking enemy and in coordination with motorized rifle company and antitank fires, repulse the attack of enemy tanks and mechanized infantry. Secure the gap with the 1/9 Motorized Rifle Battalion by fire, destroy any enemy who penetrate our defenses and support a counterattack by the 6th MRC.

Having clarified the mission, the artillery battalion commander determined those measures which must be accomplished immediately:

--issue his own instructions: to the chief of staff for the preparation and dispatch of the artillery reconnaissance group to select firing positions in the new area and to establish the battalion CP; to the chief of reconnaissance to determine the actual locations on the terrain of the targets assigned to the battalion.

--personally select firing positions for each battery in the battalion primary and reserve firing positions and the temporary position for the stand-by battery.[4]

Then the commander calculated the available time for preparing the battalion for combat (Table 1).

At 1330, the battalion commander issued his instructions: "Chief of staff, at 1440 hours dispatch the artillery reconnaissance group to the primary firing site to select two firing positions for each battery. 4th battery--the bushes (4524) and 500 meters south; 5th battery--at the two trees and 500 meters east; 6th battery--Hill 112.2 and 500 meters south. Base line of fire--53-00. Complete the topogeodetic confirmation of the map by 1900 27 April. Personally brief the artillery reconnaissance group. Be established in the battalion command post by 1530. Chief of reconnaissance, determine (using the given coordinates) the actual locations of the targets for the assigned fire concentrations (SO), moving barrages (PZO) and standing barrages (NZO)."

At 1350, the commander issued instructions to battery

commanders. "Subunits of the 2d Motorized Rifle Battalion are preparing positions to repulse a follow-on counterattack by the enemy. Batteries need to be ready to provide immediate fire support for their portions of the fire concentrations (SO) and standing barrages (NZO). At 1630, be at the battalion command post to receive the mission. Control of the batteries at that time will be passed to the commander of the base platoon."

ASSESSMENT OF THE SITUATION

The enemy, as a result of his counterattack with a superior force, has managed to move in close to our subunits in a number of sectors. He continues to conduct active combat. After regrouping, and using forces located out of direct contact and concentrated in his depth, the enemy will be able to launch an offensive on the morning of 28 April.

It is necessary to use the available time to plan and prepare the battalion fires to repel the enemy advance, organize and conduct reconnaissance, dig in the CP and equipment in the firing site, organize security and self-defense, and resupply subunits with ammunition.

The principal missions of reconnaissance are: timely detection of the regrouping of enemy forces not in direct contact, determination of the coordinates of the batteries, and detection of enemy movement from the depths.

Our subunits: 2/8 Motorized Rifle Battalion with a tank company transitions to the defense in the first echelon of the regiment on a key armor axis. The battalion defends in two echelons. In order to assure readiness, designated companies will regroup, which will require covering fire from the artillery battalion. To accomplish this, previously planned fire missions will be used.

Adjacent forces: On our right, the 1/9 Motorized Rifle Battalion is transitioning to the defense. On our left, the 3/8 Motorized Rifle Battalion defends. We have prepared the standing barrage (NZO) "Acacia" to cover the gap between the 1/9 and ourselves. The 4th battery commander must be given the mission to maintain reconnaissance on this gap.

The planned counterattack of the regimental second echelon will originate along the line defined by "Sapog" grove--mound 3. Two deployment lines for the regimental antitank reserve have been planned in our vicinity. It is necessary to coordinate the antitank fires of the 6th battery and the antitank reserve in the event of an enemy breakthrough in the vicinity of the firing positions. Coordination with the antitank reserve is also necessary for support of the counterattack and firing concentrations 91, 92, and 93.

Artillery battalion condition: The battalion is combat ready. However the losses that it has taken (two guns in the 4th battery, one gun in the 5th battery and two guns in the 6th battery) have significantly weakened its firing potential. It is necessary to requisition replacement weapons.

FIRE POTENTIAL 2/5 ARTY IN DEFENSE (13 122mm Howitzers)

Mission	Ammunition expenditure units of fire rounds	Fire Potential (suppression)
Artillery denial of enemy movement & deployment.	0,3 24×13=312	Mech Inf company column. Fire concentration, three fire strikes Expenditure 312
Artillery repulsion of enemy attack.	0,7 56×13=728	Three lines of PZO, expenditure 312, two HZO, expenditure 208, 4 to 5 single tgts, expenditure 208.
Artillery support of defending forces in their depth	0,7 56×13=728	Mechanized infantry in combat formation-three platoons. Fire concentration, expenditure 312; two NZO, expenditure 208; four to five single targets, expenditure 208.
Fire destruction of the enemy during counter-attack.	0,5 40×13=520	Mechanized infantry in combat formation-three platoons, Fire concentration, expenditure 312; four to five single targets expenditure 208.

Table 2

The previous assignment of supporting batteries to the 4th and 5th Motorized Rifle Companies will be maintained. The 5th battery will be the duty battery. The firing potential of the battalion is shown on table 2.

The fire missions established by the higher artillery chief must be more accurately matched to the terrain. The battalion must be prepared to fulfill its mission within the time alloted by the schedule.

Terrain: The terrain in the motorized rifle and artillery battalion areas will support an enemy tank attack. It is necessary to prepare the firing platoons to destroy any tanks which penetrate into the depth of our defense and to utilize fully the defensive potential of the terrain.

The distance between the primary and reserve firing position is 2.5 kilometers and will require 35-40 minutes to displace

every battery.

Hill 121.4 is a dominating feature from which the enemy can observe our force dispositions all the way back to Zhuchki. It is necessary to employ strict camouflage and concealment measures. To support night observation of the enemy, we must prepare an illumination line from Hill 117.3 to Hill 121.4.

Each battery has about 0.25 units of fire of ammunition. We must rapidly arrange to resupply not less than 1.0 units of fire of high explosive-fragmentation rounds and 50-70 illumination rounds. The battalion commander or chief of staff must determine the ammunition expenditure allowance.

THE ARTILLERY COMMANDER'S DECISION

1. Batteries will support designated companies: 4th battery will support the 4th MRC; 6th battery will support the 5th MRC. 5th battery is on stand-by.

2. Battery firing missions:

--during the artillery denial of the movement and deployment of enemy forces phase of fire, be prepared to defeat his columns by executing fire concentrations (SO) 80, 82, and 84 in battalion fires.

--during the artillery repulsion of the enemy attack phase of fire, be prepared to inflict destruction on the attacking enemy by executing moving barrages (PZO) "Hyena 1, 2, 3" and "Wolf 1, 2, 3" and standing barrages (NZO) "Acacia", "Birch", "Maple", and "Aspen" (except 4th battery).

--during the artillery support of the defending force in its depth phase of fire, be prepared to inflict destruction on the penetrating enemy by executing fire concentrations (SO) 92 and 93 and standing barrage (NZO) "Fir" in battalion fires. In order to secure our gap with the 1/9 MRB, 4th and 5th batteries will use standing barrage (NZO) "Acacia" and prepare fire concentration (SO) 85.

--during the fire destruction of the enemy in support of the counterattack phase of fire, be prepared to execute a ten-minute fire strike on fire concentrations (SO) 94, 92 and 93 in battalion fires in support of the second echelon of the 8th Motorized Rifle Regiment.

--during the conduct of reconnaissance at night and the repulsion of an enemy surprise night attack, prepare to provide periodic illumination from a temporary firing position. Illumination missions are "Light 1": x axis 43250, y axis 77800, 800 X 800; "Light 2": x axis 41500, y axis 77850, 1500 X 800.

3. Firing positions are as previously indicated. CP/OPs are to be positioned thus: Battalion and 5th Battery--on "Malaya" hill by 2030 27 April; 4th and 6th Battery--collocated with the CP/OP of your supported companies by 2100 27 April. The fire direction center will locate in the vicinity of the primary firing position of the battery. 5th battery CP/OP will be sited for observation of the gap between the 2/8 and 1/9 MRB and be

able to call for and adjust standing barrage (NZO) "Acacia" and fire concentration (SO) 85. CP/OPs will displace immediately when the MR battalion and company commanders displace.

4th Battery firing platoons will move into their primary firing positions from 2200 to 2230 27 April. 6th Battery firing platoons will move into their primary firing positions from 2230 to 2300 27 April. 5th Battery firing platoons will move into their temporary firing positions from 2300 to 2330 27 April.

In the event that the artillery battalion CP or communications are knocked out, control of the battalion is passed per SOP (until the chief of staff arrives to take charge).[5]

At 1515 27 April, the chief of staff arrived at the artillery battalion CP/OP and reported that the artillery reconnaissance group was dispatched to reconnoiter the firing sites on time, that the requests for five replacement howitzers and ammunition resupply had been passed, and that he had received the extract from the 8th RAG firing tables.

The artillery battalion commander studied the extract from the 8th RAG firing tables, briefed the chief of staff on their orders and his decision, and gave the order:

"Until 1630, work up the battalion firing tables. Confirm the targets with the terrain with the chief of reconnaissance. I am going on a terrain reconnaissance with the MR battalion commander. Stay here to act in my stead."

ON-SITE WORK

From 1530 to 1630, the artillery battalion commander participated in the MR battalion commander's reconnaissance [rekognostsirovka). Before the reconnaissance started, he reported (to the MRB commander) on the structure, condition, status and support posture of the battalion. Further, he reported on the battalion's readiness to fire those missions assigned by the artillery group commander and verified against the terrain. The report included the ammunition expenditure allowance (daily rate of 0.2 units of fire prior to the enemy transition to the offensive and 2.2 units of fire once the enemy transitions to the offense) and the firing potential of the battalion (Table 2). The report also included the primary, alternate and temporary firing positions; CP/OP locations (battalion to be collocated with the MR battalion on "Fasol'" hill by 2030 27 April and batteries to be collocated with their supported companies by 2100 27 April); and occupation of firing positions (5th and 6th batteries would move into their primary positions between 2200 and 2300 27 April, while 4th battery would move into a temporary firing position between 2300 and 2330). The artillery battalion would be prepared to fire from its new positions by 2330 27 April.

During the organization of coordination, the artillery and motorized rifle battalion commanders agreed to the actions of the companies with their supporting batteries and other weapons

systems during the phases of defensive fire [the artillery denial of the movement and deployment of enemy forces, the artillery repulsion of the enemy attack, the artillery support of the defending force in its depth, and the fire destruction of the enemy in support of the counterattack]. The commanders paid particular attention to clarifying the lines at which ATGM, tank, BMP, automatic grenade launchers subunits and other antitank weapons would open fire. Equal attention was devoted to the direct and indirect fire concentration areas on the more important axes of advance; the fire mission to seal the gaps between strongpoints and on open flanks; and also the agreed upon actions of the subunits in destroying any enemy who had penetrated into the battalion defenses.

Agreement was reached on methods of target designation, and signals for early warning, control and coordination.

The artillery battalion commander met with his battery commanders on the south slope of "Fasol'" hill at 1630 27 April. The chief of staff reported to the commander the distribution of firing missions to the batteries. The battalion commander oriented his commanders on the ground and then gave them his combat order.

"1. The enemy has managed to penetrate into the positions of subunits in a number of sectors. He continues to conduct active combat. After regrouping, we will wait for his next attack.

Reconnaissance tells us that the enemy has concentrated his reserves 30-35 kilometers to the west in the vicinity of hill 117.3. The enemy will be able to launch an offensive on the morning of 28 April.

2. The 2d MRB transitions to the defense in the region bounded by the ravine, Dvoriki, Zhuchki with the mission of preventing an enemy breakthrough on the axis Hill 117.3--Zhuchki and axis "Temnaya" grove--Zhuchki. The combat power of the battalion is concentrated on the critical areas of Hill 118.4, the crossroads and Zhuchki.

The battalion is defending in two echelons. In the first echelon, 4th MRC is on the right and 5th MRC is on the left. 6th MRC is in the second echelon. The companies will occupy their strong points between 2100 and 2200.

On our right, the 1/9 Motorized Rifle Battalion is also defending. The boundary line with them is (the commander shows this to his commanders on both the map and the ground).

On our left, the 3/8 Motorized Rifle Battalion is transitioning to the defense. The boundary line with them is (the commander shows this to his commanders on both the map and the ground).

3. The senior artillery commander is supporting the 2d MRB by concentrating fires to destroy the enemy during his movement and deployment, and has prepared moving and standing barrages to repulse an enemy attack on the axis "Temnaya" grove--Hill 121.4

4. The 2/5 Artillery Battalion is part of the 8th RAG and is in support of the 2/8 MRB. These are the primary, alternate

and temporary firing positions of 5th Battery (he shows them on the map). The base line of fire is 53-00. Complete combat readiness is essential for effective destructive fire. The march route between the primary and alternate firing position is as shown on the map.

5. I order:

a) 4th battery to support 4th MRC in its defense of its strongpoint (as shown on the map and during terrain orientation). During the artillery denial of the movement and deployment of enemy forces phase, be prepared to fire concentrations (SO) 80 and 82. During the artillery repulsion of the enemy attack phase, be prepared to fire moving barrage (PZO) "Hyena 1, 2 and 3", "Wolf 1, 2 and 3"; standing barrage (NZO) "Acacia", "Birch", and "Maple". During the artillery support of the defending force in its depth phase, be prepared to fire concentrations (SO) 92, 93, 95, and standing barrage (NZO) "Fir". During the fire destruction of the enemy in support of the counterattack phase, be prepared to cover the movement of the second echelon; during the artillery preparation for the counterattack, be prepared to conduct a 10-minute fire strike on fire concentration (SO) 94; during the artillery support of the counterattack, be prepared to fire concentrations (SO) 92 and 93. The primary and alternate firing positions are as shown on the map. The battery will move into its primary position between 2200 and 2230 27 April. Battery CP/OP will collocated with that of 4th MRC by 2100 27 April.

b and c (5th and 6th Battery missions are analogous and have been omitted).

6. Ammunition expenditure for the defensive battle is 2.2 units of fire. Expenditure by phase:

artillery denial of the movement and deployment of enemy forces--0.3 units of fire.

artillery repulsion of the enemy attack--0.7 units of fire.

artillery support of the defending force in its depth--0.7 units of fire.

fire destruction of the enemy in support of the counterattack--0.5 units of fire.

7. Be ready to open fire from the primary and temporary firing positions by 2330, 27 April.

8. The battalion CP/OP will be collocated with the CP/OP of 2d MRB on "Fasol'" hill effective 2030 27 April. The FDC will be located in the vicinity of 5th Battery's firing position effective 2230, 27 April.

Succession of command in case the CP/OP, the FDC and communications are knocked out is per SOP.

The commander further amplified on several coordination questions:

"The motorized rifle companies occupy their strongpoints from 2100 to 2200 27 April. During this time, batteries will cover them from their present positions. In the event of an enemy surprise attack, 4th Battery will fire standing barrage

"Acacia", 5th Battery will fire standing barrage "Birch", and 6th Battery will fire standing barrage "Cherry".

No firing will be conducted after the batteries occupy their primary firing positions until the enemy begins his attack, unless I authorize it.

Before the enemy transitions to the attack, there is the possibility that he will employ weapons of mass destruction. Batteries exposed to the effects of nuclear weapons must quickly organize help for the victims, eliminate the after-effects of the nuclear strike, and restore combat effectiveness. For this purpose, every battery will establish a 15-man rescue force headed by a howitzer platoon leader.

Notification of the immediate threat of enemy use of weapons of mass destruction is the signal "Comet". Upon receipt of this signal, batteries not conducting a fire mission will move their personnel and equipment into trenches and dugouts.

Maintain uninterrupted observation of the antitank minefield in front of the forward edge of our positions. Report the discovery of any minefield breaches immediately to me.

The standing barrages will repulse the enemy attack. Open fire at my command and then independently conduct fires of maximum intensity. Prior to the offensive and especially at night, the guns in the primary position must be laid on the predesignated standing barrages.

The howitzer platoons must be prepared to combat tanks which have broken through to our firing positions. The order for the howitzer platoons to conduct self-defensive fires will be given by the senior officer in the battery or the chief of staff.

Maneuver within the confines of the primary and alternate firing positions will occur only upon my command, the codeword for which is "gun carriage". The codeword to move the CP/OP is "Compass". Early warning codewords are per SOP."

While organizing combat support, the battalion commander gave orders for reconnaissance:

"4th Battery will conduct reconnaissance in the zone whose right boundary is defined by the northern slope of Hill 118.4 to the northern slope of Hill 117.3 and whose left boundary is defined by the southern slope of Hill 118.4 to that portion of the road bordered by bushes. 6th Battery will conduct reconnaissance in the zone whose right boundary if defined by the road junction to the southern slope of Hill 121.4 and whose left boundary is defined by the tree-lined road. The battalion CP/OP and 5th Battery will conduct reconnaissance in the zone whose right boundary is defined by the southern slope of Hill 118.4 to the depression flanked by bushes and whose left boundary is defined by the road junction Hill 118.4 to Hill 121.4.

Reconnaissance missions: Detect the firing points of artillery and mortar batteries in the area of the bridge, "Vysokaya" grove, and the elevation marked by the three trees; determine the time that the enemy will concentrate his forces in front of 2d MRB and the direction of his attack; locate command and control points along the line Hill 117.3--Hill 121.4.

In order to observe the gap between 1/9 MRB and 2/8 MRB and call for standing barrage "Acacia", 4th Battery will establish a supplemental reconnaissance zone whose right boundary is defined by Hill 118.4 to the ravine.

The battalion commander gave additional instructions for protection against weapons of mass destruction, camouflage and deception, engineer fortification of firing positions and so on.

PLANNING COMBAT ACTIVITY

The chief of staff set about planning combat activity based on his instructions from the battalion commander and the extracts from the artillery group firing tables.

Fire planning. The chief of staff drew the targets; artillery battalion disposition; CP/OP and OP locations; primary, alternate and temporary firing positions; and the prepared alternate sites for CP/OPs on the working map. He distributed firing missions between the batteries and for critical missions, he assigned several batteries. He developed the table of fire (Chart 3) and supplements to it--the list of target coordinates.

Maneuver planning. Primary and alternate routes for moving batteries from their primary to alternate firing positions are initially planned on the map (and then verified on the ground). The time required to tear down and leave the old position, the time required to move to the new position and the time required to set up in the new position are calculated. The signals for shifting positions (either per SOP or as given by commander) are listed. All these are posted on the working map.

Per the order of the chief of staff and senior battery officers, plotters compute the data for firing on preplanned targets and enter the results in the tables of calculated data. In practice, confirmed calculated data is derived for the primary firing position, but only topogeodetic data is determined for other firing positions. The chief of staff verified the data of the batteries with the firing data calculated at the battalion.

Organizing local security for the firing position. At 1930 27 April, the battalion chief of staff arrived at the site for the main firing position, listened to the artillery reconnaissance group commander's report on the accomplished work, approved the firing positions, noted their coordinates and gave the firing platoon commanders instructions for local security and for coordination between the batteries' firing positions.

"The main armored axis of advance is from Hill 118.4 to north of the outskirts of Zhuchki. It is possible that tanks may also break through on the flanks. These are the zones for the conduct of direct fire: 4th Battery--right boundary, the yellow bushes to the two trees, left boundary, the road; 5th Battery--right boundary, the wide bush to the precipice, left boundary, the yellow trench to Hill 112.2; 6th Battery--right boundary, Hill 112.2 to the southern outskirts of Zhuchki, left boundary, the crooked tree to the small bush.

Enemy tanks advancing along the road from Zhuchki will be

Table 3

"APPROVED"
Commander 8th RAG
LTC S. Petukhov
27 April 1988

TABLE OF FIRE 2/5 ARTY IN DEFENSE. FDC--Bushes (4282)
27 April 1988 1700. Map 50,000 printed 1982.

Actions of combined arms subunits	Missions (Phases) of fire destruction of the enemy	Battalion Missions & conditions for successful completion	Signals to open fire	Fire Missions (Target number & ammo allocation		
				4th Battery	5th Battery	6th Battery
Defense of occupied region and strong points	Artillery denial of enemy movement and deployment	Fire strikes to deny enemy columns of movement and deployment Be prepared to fire on targets.		Fire Concentrations 80, 82 & 84	Fire Concentrations 80, 82 & 84	Fire Concentrations 80, 82 & 84
Defense of occupied regions and strong points. All weapons fire to repulse enemy attack.	Artillery repulse of enemy attack	Concentrated barrier fires & fires on single targets to destroy the enemy in front of the forward edge & during the battle for the first position. Be prepared to fire on targets.		PZO "Hyena--1, 2, 3" "Wolf-1, 2, 3" NZO "Acacia" "Birch" "Maple" "Aspen" SO 85	PZO "Hyena--1, 2, 3" "Wolf--1, 2, 3" NZO "Acacia" "Birch" "Maple" "Aspen" SO 85	PZO "Hyena--1, 2, 3" "Wolf--1, 2, 3" NZO "Acacia" "Birch" "Maple" "Aspen"

Actions of combined arms subunits	Missions (Phases) of fire destruction of the enemy		Battalion Missions & conditions for successful completion	Signals to open fire	Fire Missions (Target number & ammo allocatio		
					4th Battery	5th Battery	6th Battery
Fires of all weapons & strongpoints to deny enemy development of a penetration into the depth and flanks.	Artillery support of defending forces in their depths.		Fire concentrations & barrier fires destroy enemy forces penetrating into the defense, cover the flanks and gaps between strong points with fire. Be prepared to fire on targets.		SO 92, 93, 94; HZO "Fir", "Pine"; SO 85.	SO 62, 63; HZO "Fir", "Pine"; SO 85.	SO 62, 63, HZO "Fir".
Regt 2d Echelon (3d MRB w/ tank co) moves for counter-attack. First echelon fights to retain defensive positions.	Fire destruction of enemy during counterattack	Artillery cover of moving forces.	Concentrated fire covers the movement of the second echelon to counterattack line Be prepared to fire on tgts.		—	—	—
		Artillery support of counterattack.	10 minute fire preparation for 2d echelon counterattack. Be prepared to fire on tgts.	"Storm"	SO 94	SO 94	SO94

Actions of combined arms subunits	Missions (Phases) of fire destruction of the enemy		Battalion Missions & conditions for successful completion	Signals to open fire	Fire Missions (Target number & ammo allocation)		
					4th Battery	5th Battery	6th Battery
2d echelon counterattacks from line 'Sapog' bushes-mound 3 to destroy penetrating enemy and restore situation.	Fire destruction of enemy during counterattack	Artillery support of counterattack.	Fire concentrations & fires on single targets to spt 2d echelon counterattack. Be prepared to fire on targets.		30 92, 93.	30 92, 93	30 92, 93

SIGNALS:

Call for fire: Series of green rockets
Cease fire. "Stop", series of red rockets
Own forces: Series of white rockets

AMMUNITION EXPENDITURE --2.2 units of fire

Artillery denial of enemy movement and deployment --0.3 units of fire.
Artillery repulse of enemy attack--0.7 units of fire
Artillery support of defending forces in their depth--0.7 units of fire.
Fire destruction of the enemy during counterattack--0.5 units of fire.

Annex: List of coordinates of targets.

Commander 2/5 Arty
Major A. Vinogradov

Chief of Staff
Captain N. Suslov

destroyed by the howitzer platoons of 5th and 6th Batteries.

Enemy tanks advancing from the direction of the ravine will be destroyed by the howitzer platoons of 4th Battery in conjunction with the regimental antitank reserve. The antitank reserve has prepared firing line 3 between the "Nizkii" bushes and the two trees. Enemy tanks advancing in the direction Dvoriki-Zhuchki will be destroyed by the howitzer platoons of 6th Battery.

EXTRACT FROM 8TH RAG COUNTERPREPARATION TABLE OF FIRE.
CP--East of the edge of "Sapog" Grove (4185). 27 Apr 88. 2000.
Map 50,000. Printed 1982.

Action of combined arms subunits	Battalion Missions & conditions for successful completion	Signal to open fire.	Fire mission (Target #, ammo allocation)
Defend occupied positions & strong points. Duty wpns in constant readiness to destroy single enemy group.	From "N" to "N+3" (3 minutes). Suppress mortar platoon.	"Whirlwind"	Tgt 102 220
	From "N+3 to N+15 (12 min) Suppress mech Bn CP & OP.	Water spout	Tgt 88 180 Tgt89 140

Footnote: List of target coordinates.

Tgt 102, Mortar platoon	$x = 42760$,	$y = 77910$,	$h = 115$;
Tgt 88, Mech Bn CP	$x = 42980$,	$y = 78120$,	$h = 120$;
Tgt 89, OP	$x = 43320$,	$y = 78615$,	$h = 120$.

Group Chief of Staff
LTC L. Nazarenko

Table 4

The senior officer in 4th Battery is to coordinate this ground defense plan with the commander of the antitank reserve while that commander supervises work on firing line 3. The senior officer of each battery will organize measures for local security and self defense. Determine areas for minelaying. Complete your plan for self defense by 2400. Train your personnel from 0130 to 0150 in the self-defense measures which have been developed."

At 2045 27 April, the chief of staff received the extract from the 8th RAG table of fire which defined the battalion's role in the artillery group counterpreparation.

Simultaneously, he received the following combat instruction from the staff of the 8th RAG: "For the period 0030 to 2300 28 April, designate a roving platoon from a battery which will deploy into the primary firing position. The platoon will conduct fire from the old 4th, 5th and 6th Battery positions. From every firing position, fire one or two fire missions to suppress targets identified by battalion reconnaissance. Ammunition expenditure allowance: HE-fragmentation--110 rounds, illumination--15. Erect dummy howitzers in the firing positions by 0600 28 April. Submit your plan for the activities of the roving platoon for approval by 2330 27 April."

The chief of staff studied the documents and reported their contents to the battalion commander. Then he confirmed the plan for combat maneuver and drew the targets on the map and worked up the firing table for the artillery counterpreparation. He gave the orders to the FDC for calculation of firing data.

While planning the activities of the roving platoon, he designated the roving platoon from 5th Battery, assigned the time and firing position number for the initial conduct of fire, determined the targets suppression and the type of fire, set the ammunition expenditure allowance, and elaborated the maneuver plan to the roving platoon commander.

The battalion commander, having received the completed documents from the chief of staff, had them approved by the RAG commander and used them as the basis for missions to his battery commanders.

"Approved"
Commander 8th RAG
LTC S. Petukhov

2/5 ARTY TABLE OF FIRE FOR COUNTERPREPARATION
FDC--Bushes (4282). 27 April 88 2200
Map 50,000, printed 1982

Action of combined arms subunits	Battalion missions & conditions for successful completion.	Signal to open fire.	Fire mission: Target # / ammo allocation		
			4th Battery	5th Battery	6th Battery
Defend occupied positions & strong points. Duty wpns in constant readiness to destroy single enemy group.	From "N" to "N+3" (3 minutes). Suppress mortar platoon.	"Whirlwind"	Tgt 102 / 72	Tgt102 / 72	Tgt 102 / 72
	From "N+3 to N+15 (12 min) Suppress mech Bn CP & OP.	"Water spout"	Tgt 88 / 108	Tgt88 / 72	Tgt89 / 144

Footnote: List of target coordinates:

Tgt 102, Mortar platoon	$x=42760$,	$y=77910$,	$h=115$;
Tgt 88, Mech Bn CP	$x=42980$,	$y=78120$,	$h=120$;
Tgt 89, OP	$x=43320$,	$y=78645$,	$h=120$.

Commander 2/5 Arty
Major A. Vinogradov

Table 5

Chief of Staff
Captain N. Suslov

APPROVED

Commander 8th RAG

LTC S. Petukhov

PLAN

ACTIVITY OF THE 2/5 ROVING PLATOON IN THE DEFENSE
FDC--BUSHES (4282), 27 APRIL 88 2330
MAP 50,000 PRINTED 1982

Begin fire	Firing point number and coordinates	Fire Mission	Order for Conduct of fire	Ammunition allocation
0.40 28.4	№ 1; $x=40980$, $y=82310$	Engage mechanized infantry & weapons on hill 117.3	Registration with range finder	HE Frag 22 Illumin 7
3.10	№ 2; $x=40340$, $y=83170$	Engage OP on hill 121.4	Registration with range finder	HE-Frag 30 Illumin 8
6.30	№ 3; $x=41130$, $y=83115$	Engage newly discovered tgts	Registration by adjustment of rounds & range finder	HE-Frag 30
9.50	№ 2; $x=40340$, $y=83170$	Engage newly discovered tgts	Registration with range finder	HE-Frag 20
14.40 28.4	№ 1; $x=40980$, $y=82310$	Engage newly discovered tgts	Registration with range finder	HE-Frag-23

Footnotes: 1. Platoon selected from and fires controlled by 5th battery commander

2. Signal to move to the new designated firing position -- Crossing

Commander 2/5 Artillery
Major A. Vinogradov

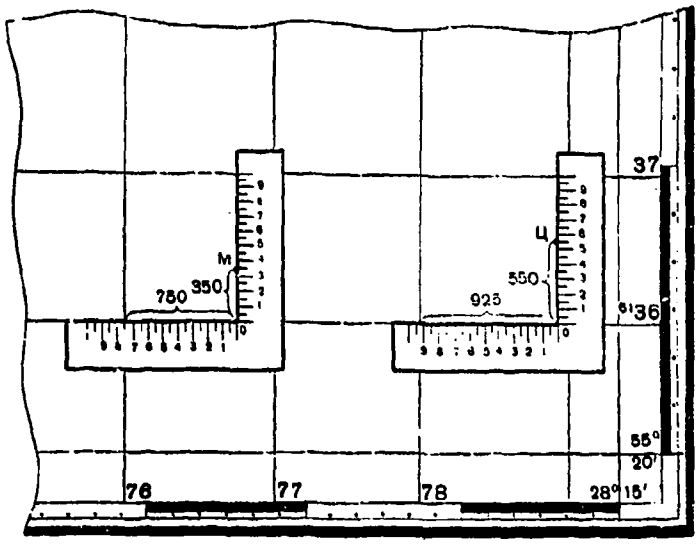
Table 6

Chief of Staff
Captain P. Suslov

ENDNOTES

1. Unit of fire [boyevoy komplekt] is a Soviet logistics term which varies with each weapons system. It is not analogous to the US "basic load" or "required supply rate." It is an administrative term for a number of rounds which varies with each weapon. Fire missions are computed in terms of units of fire or fractions of units of fire. The "units of fire" concept works well within a "push" logistics system.

2. Exact coordinates are given in terms of an x an y axis. Contrary to the US system, the x axis is the vertical axis and the y axis is the horizontal axis. Thus, the Soviets read maps "up and right". B. E. Byzov, A. N. Kovalenko & A. F. Lakhin, Voyennaya topografiya [Military topography], (Moscow: Voyenizdat, 1980), pp. 92-93 gives the following example:



For point M, axis x is 36350, axis y is 76750. For point U, axis x is 36550, axis y is 78925. Common Soviet tactical map scales are 1:25000 and 1:50000. Tactical templates are constructed with built-in scales for reading maps in both these scales.

3. This is measured in Soviet mils. There are 6000 Soviet mils in a circle--as compared to 6400 Western mils. The Soviets use the same rule of thumb that a shift of 1 mil will shift impact by 1 meter at 1000 meters.

4. Artillery fires against reconnaissance elements, ground probes, advance guards and other lead elements are conducted by stand-by units firing from temporary positions. These temporary positions are located away from the primary and alternate firing positions and are designed to provide effective artillery support while not disclosing the positions from which the main artillery battle will be fought. After completing a fire mission from a

temporary position, a battery will move to an alternate temporary firing position--or rejoin its battalion in the primary position.

5. The artillery battalion commander and battery commanders are collocated forward with their supported maneuver battalion and company commanders. The chief of staff is located at the firing position. Since the artillery battalion is commanded from forward positions, in the event that the battalion CP/OP is knocked out, the chief of staff must come forward to command the battalion. In the interim, a surviving company commander must control the battalion fires.

ANNEX B: Artillery Planning Data. Extracted from V. Ya. Lebedev, Spravochnik ofitsera nazemnoy artillerii [Field artillery officer's handbook], (Moscow: Voyenizdat, 1984) and FBIS publication JPRS-UMA-85-011-L dated 30 April 1985.

Expenditure Rate of Artillery and Mortar Rounds for Engaging Fixed Unobserved Targets

№	Target	Fire Mission	Rifled Guns							Mortars				Rocket Artillery		
			Caliber, mm											Medium caliber	Medium caliber, long range	Large caliber
			76	85	100	122	130	152	203	82	120	160	240			
1	Launcher	Annihilation (per target)	800	720	540	300	280	200	70	—	—	140	60	510	360	200
2	Battery (platoon) of self-propelled armored pieces (mortars)	Neutralization (per target)	1000	900	720	450	360	270	120	—	450	220	120	560	400	240
3	Battery (platoon) of self-propelled unarmored or covered, towed pieces (mortars)	Same as above	540	480	360	240	220	180	100	400	240	160	100	400	320	180
4	Battery (platoon) of towed pieces (mortars) in the open	Same as above	250	220	150	90	80	60	30	180	90	40	20	150	120	60
5	Surface-to-air missile battery	Same as above	250	240	200	150	150	100	60	—	—	—	—	—	200	100
6	Vehicular radio or radar, or radar control post, in the open	Same as above	420	360	280	180	180	120	60	350	180	80	40	300	240	120
7	Personnel and weapons under cover in deliberate defense strongpoint	Neutralization (per hectare of target area)	480	450	320	200	200	150	60	—	200	100	50	320	240	100
8	Personnel, weapons, tanks and infantry fighting vehicles (armored personnel carriers) under cover in hasty defense strongpoint, in concentration area, assembly area, or attack position	Same as above	400	350	250	150	150	110	45	300	140	65	45	240	180	80
9	Personnel and weapons in the open in concentration area, assembly area, or attack position	Same as above	50	45	30	20	20	15	5	35	10	8	4	10	8	5
10	Command post in bunkers or other shelters	Same as above	480	450	320	200	200	150	60	—	200	100	50	320	240	100
11	Command post in the open (in vehicles)	Same as above	120	100	80	50	50	40	15	—	25	20	10	30	20	15
12	ATGM launcher, antitank gun or other individual target in the open	Neutralization (per target)	250	240	180	140	140	100	50	240	140	80	35	—	—	—

Basic Technical Specifications of Selected Artillery Pieces, Mortars and Rocket Artillery Combat Vehicles

Characteristic	Guns				Howitzers			Howitzer-gun	Gun-howitzer	Self-Propelled Guns		Mortars			Rocket Artillery Combat Vehicles		
	57-мм	85-мм	100-мм	130-мм	122-мм М-30	122-мм Д-30	152-мм	152-мм	152-мм	122-мм	152-мм	82-мм	120-мм	160-мм	БМ-14	БМ-21	БМ-24
Maximum range, m	8400	15 650	20 000	27 000	11 800	15 300	12 390	17 230	17 410	15 200	17 300	3040	5700	8040	9810	20 750	16 790
Point-blank range with 2-m target, m	1100	970	1080	1170	630	940	580	720	720	940	580	—	—	—	—	—	—
Rate of fire per minute	20—25	15—20	8—10	7—8	5—6	6—8	3—4	3—4	5—6	4—5	3	15—25	6—15	3	16	40 in 20 sec	12 in 6—8 sec
Total traverse, °	54	58	58	50	49	360	35	58	58	360	360	6	30	10	70	102	70
Maximum quadrant elevation, °	25	35	45	45	63,5	70	65	65	45	70	60	85	80	80	50	55	50
Minimum quadrant elevation, °	—5	—7	—5	—2,5	—5	—7	—1	—2	—5	—3	—4	45	45	50	0	0	0
System weight in traveling position, kg	1250	1725	3650	8450	2500	3290	3040	8070	5720	15 700	27 500	56	500	1470	8200	13 700	8910
Projectile weight, kg	3,14	9,54	15,6	33,4	21,76	21,76	40	43,5	43,56	21,76	40	3,3	15,9	41,14	51,45	92,85	102,77
Conversion time from initial to firing position, min	0,5—0—6	0,6—1	1—2	3—4	1—1,5	1,5—2,5	2	8—10	2—2,5	1	2	1	1—1,5	6	1,5	3	1,5—2
Maximum permissible speed, km/hr	50	60	50	50	50	60	40	60	60	60	60	50	35	50	60	75	60

Conversion of Mils to Degrees and Minutes

Table A - Degrees

Mils	0-00	1-00	2-00	3-00	4-00	5-00	6-00	7-00	8-00	9-00
00-00	0	6	12	18	24	30	36	42	48	54
10-00	60	66	72	78	84	90	96	102	108	114
20-00	120	126	132	138	144	150	156	162	168	174
30-00	180	186	192	198	204	210	216	222	228	234
40-00	240	246	252	258	264	270	276	282	288	294
50-00	300	306	312	318	324	330	336	342	348	354

Table B - Degrees, Minutes

Mils	0-00	0-01	0-02	0-03	0-04	0-05	0-06	0-07	0-08	0-09
0-00	0 00	0 04	0 07	0 11	0 14	0 18	0 22	0 25	0 29	0 32
0-10	0 36	0 40	0 43	0 47	0 50	0 54	0 58	1 01	1 05	1 08
0-20	1 12	1 16	1 19	1 23	1 26	1 30	1 34	1 37	1 41	1 44
0-30	1 48	1 52	1 55	1 59	2 02	2 06	2 10	2 13	2 17	2 20
0-40	2 24	2 28	2 31	2 35	2 38	2 42	2 46	2 49	2 53	2 56
0-50	3 00	3 04	3 07	3 11	3 14	3 18	3 22	3 25	3 29	3 32
0-60	3 36	3 40	3 43	3 47	3 50	3 54	3 58	4 01	4 05	4 08
0-70	4 12	4 16	4 19	4 23	4 26	4 30	4 34	4 37	4 41	4 44
0-80	4 48	4 52	4 55	4 59	5 02	5 06	5 10	5 13	5 17	5 20
0-90	5 24	5 28	5 31	5 35	5 38	5 42	5 46	5 49	5 53	5 56

Calculation of Map Range and Grid Azimuth of Target

Н	0–105		105–213		213–325		325–445		445–577		577–727		727–900		900–1000		Н
4 +Δx/−Δy	45-00		46-00		47-00		48-00		49-00		50-00		51-00		52-00		+Δx/−Δy
3 −Δy/−Δx	30-00		31-00		32-00		33-00		34-00		35-00		36-00		37-00		−Δy/−Δx
2 −Δx/+Δy	15-00		16-00		17-00		18-00		19-00		20-00		21-00		22-00		−Δx/+Δy
1 +Δy/+Δx	0-00		1-00		2-00		3-00		4-00		5-00		6-00		7-00		+Δy/+Δx
	Н 0. …	Д 1. …	Н 0. …	Д 1. …	Н 0. …	Д 1. …	Н 0. …	Д 1. …	Н 0. …	Д 1. …	Н 0. …	Д 1. …	Н 0. …	Д 1. …	Н 0. …	Д 1. …	
00	000	000	105	005	213	022	325	051	445	095	577	153	727	236	900	316	100
02	002	000	107	006	215	023	327	052	448	096	580	156	730	238	901	318	98
04	004	000	109	006	217	024	330	051	450	097	583	157	731	240	908	321	96
06	006	000	111	006	219	024	332	051	451	098	586	159	736	242	912	324	94
08	008	000	113	006	221	025	334	051	456	099	589	160	738	244	916	326	92
10	010	000	116	007	224	025	337	058	458	100	591	161	741	246	919	328	90
12	013	000	118	007	226	026	339	056	460	101	594	161	746	247	923	330	88
14	015	000	120	007	228	026	341	057	463	102	597	161	749	249	927	333	86
16	017	000	122	007	230	027	344	057	465	103	600	163	752	251	931	336	84
18	019	000	124	007	232	027	346	058	468	104	603	167	756	253	935	339	82
20	021	000	126	008	235	027	349	059	471	106	606	165	759	255	939	342	80
22	023	000	129	008	237	028	351	059	473	106	609	171	762	257	943	374	78
24	025	000	131	009	239	028	353	060	476	107	611	172	766	259	947	377	76
26	027	000	133	009	241	029	356	061	478	109	614	174	769	261	951	379	74
28	029	000	135	009	243	029	358	062	481	110	617	175	772	263	955	382	72
30	031	000	137	009	246	030	360	063	484	111	620	176	776	265	959	385	70
32	034	001	139	010	248	030	362	064	486	112	623	178	779	267	963	388	68
34	036	001	141	010	250	031	365	064	489	113	626	179	782	269	967	391	66
36	038	001	143	010	252	031	367	065	491	114	629	181	786	272	971	394	64
38	040	001	146	010	254	032	370	066	494	115	632	183	789	274	975	397	62
40	042	001	148	011	257	032	372	067	496	116	635	185	793	276	979	400	60
42	044	001	150	011	259	033	374	068	499	117	638	186	796	278	983	403	58
44	046	001	152	011	261	033	377	068	502	119	640	188	799	280	987	406	56
46	048	001	154	012	263	034	379	069	504	120	643	189	803	282	992	409	54
48	050	001	156	012	266	034	381	070	507	121	646	190	806	285	996	411	52
50	052	001	158	012	268	035	384	071	510	122	619	192	810	287	1,000	414	50
52	055	001	159	013	270	036	386	072	512	124	652	194	813	289			48
54	057	002	161	013	272	036	389	073	515	125	655	195	817	291			46
56	059	002	165	013	275	037	391	074	518	126	658	197	820	293			44
58	061	002	167	014	277	037	393	075	520	127	661	199	824	295			42
60	063	002	169	014	279	038	396	075	523	129	664	200	827	298			40
62	065	002	171	014	281	040	398	076	525	130	667	202	831	300			38
64	067	002	173	015	284	040	400	077	528	131	670	204	834	302			36
66	069	002	175	015	286	041	403	078	531	132	673	205	838	305			34
68	071	002	178	015	288	041	405	079	533	134	676	206	841	307			32
70	073	003	180	016	291	042	408	080	536	135	680	209	845	309			30
72	076	003	182	016	293	042	410	081	539	136	683	211	849	311			28
74	078	003	184	016	295	043	413	082	542	138	686	212	852	314			26
76	080	003	186	017	297	043	415	083	544	139	689	214	856	316			24
78	082	003	188	017	300	044	418	084	547	140	692	216	860	318			22
80	084	003	191	018	302	044	420	085	550	142	695	218	863	321			20
82	086	004	193	018	304	045	423	086	553	143	698	220	867	323			18
84	088	004	195	018	306	045	425	087	555	144	701	221	870	326			16
86	090	004	197	019	309	046	428	088	558	145	704	223	874	328			14
88	092	004	199	019	311	047	430	089	561	146	707	225	878	330			12
90	094	004	201	020	313	048	433	090	563	148	711	227	882	333			10
92	097	005	204	020	316	048	435	091	566	149	714	229	885	335			08
94	099	005	206	021	318	049	438	092	569	150	717	231	889	338			06
96	101	005	208	021	320	050	440	093	572	152	720	233	893	340			04
98	103	005	210	022	323	050	443	094	575	153	723	235	897	343			02
100	105	006	213	022	325	051	445	095	577	155	727	236	900	345			00
+Δx/+Δy	14-00		13-00		12-00		11-00		10-00		9-00		8-00		7-00		+Δx/+Δy 1
+Δy/−Δx	29-00		28-00		27-00		26-00		25-00		24-00		23-00		22-00		+Δy/−Δx 2
−Δx/−Δy	44-00		43-00		42-00		41-00		40-00		39-00		38-00		37-00		−Δx/−Δy 3
−Δy/+Δx	59-00		58-00		57-00		56-00		55-00		54-00		53-00		52-00		−Δy/+Δx 4
Н	0–105		105–213		213–325		325–445		445–577		577–727		727–900		900–1000		Н

Rate of Fire of Rifled Pieces

Length of Fire, minutes	76-mm Gun ZIS-3		76-mm Mountain Gun, All Charges	85-mm Gun		100-mm Gun		T-12 System, Full Charge	122-mm Howitzer		130-mm Gun		152-mm Howitzer		152-mm Howitzer-Gun		152-mm Gun-Howitzer		203-mm Howitzer, All Charges
	Charge			Charge		Charge			Charge		Charge		Charge		Charge		Charge		
	Full	Reduced		Full	Reduced	Full	Reduced		Full, 1st	4th-6th	Full, 1st	3d, 4th	Full, 1st	4th-6th	Full, 1st	6th-12th	Full, 1st	3d-6th	
1	15	15	20	10	10	7	7	7	6	6	5	5	4	4	4	4	4	4	1
3	35	35	40	25	25	18	18	20	16	16	12	12	12	12	12	12	12	12	2
5	50	50	50	40	40	30	30	35	25	25	20	20	20	20	20	20	20	20	3
10	70	70	65	50	60	50	50	45	40	40	35	35	30	30	30	30	30	30	6
15	85	85	80	60	75	60	65	55	55	55	45	45	40	40	40	40	40	40	9
20	100	100	90	70	90	65	75	60	65	70	55	55	50	50	50	60	50	50	12
25	110	115	100	80	100	70	90	65	70	80	65	65	60	60	55	60	60	60	15
30	115	130	110	90	110	75	100	70	75	90	70	75	65	70	60	70	65	70	18
40	125	160	130	110	130	85	120	75	85	110	80	90	75	90	70	80	75	80	22
50	140	180	145	125	150	90	140	90	90	130	90	105	80	105	75	95	80	95	26
60	150	200	160	140	170	95	160	100	100	150	100	120	90	120	80	110	90	110	30
120	220	320	260	230	290	135	250	—	150	260	160	210	135	210	120	200	135	200	60
Each hour thereafter	70	100	90	80	100	40	80	—	50	80	35	70	45	70	35	60	45	60	25

Notes:

1. Rate of fire is determined for intermediate charges by interpolation proportionate to the charge number.
2. Rate of fire norms above the broken line are limited by capabilities of the gun crews; those below the broken line are limited by equipment capabilities.
3. Rate of fire norms correspond to an air temperature from -10 to +10°C. With a temperature deviation, norms below the broken line change 10 percent every 10° (they drop with a rise in temperature and increase with a drop in temperature).

Rate of Fire of Mortars

Length of Fire, minutes	Mortars						
	82-mm		120-mm		160-mm	240-mm	
	Ten-vaned round	Six-vaned round	Maximum charge	Minimum charge	All charges	All charges except special	Special charge
1	20	20	9	9	3	1	1
3	45	45	25	25	9	3	3
5	75	60	30	30	12	5	5
10	110	75	35	35	18	10	10
15	125	85	40	40	21	15	13
30	150	100	50	75	30	30	20
60	210	140	70	105	48	38	25
120	—	—	110	165	83	51	35
180	—	—	150	225	128	61	45

Note. Rate of fire for intermediate charges is determined by interpolation proportionate to the charge number.

Rate of Fire of Rocket Artillery (In Volleys)

Length of Fire, minutes	Rocket Artillery					
	Medium Caliber		Medium Caliber Long-range		Large Caliber	
3	1	1	1	1	1	1
10	2	2	2	2	2	2
15	3	3	3	3	3	3
20	4	4	4	4	4	4
25	5	5	5	4	5	4
30	6	6	6	5	6	5
Every hour thereafter	6	4	4	3	4	3

Note. Combat vehicles are loaded for the first volley.

Table - Tangents of Angles

(Angles in mils every 0-10 mils)

Mils	0-00	1-00	2-00	3-00	4-00	5-00	6-00	7-00	8-00	9-00	10-00	11-00	12-00	13-00	14-00
0-00	0,000	0,105	0,213	0,325	0,445	0,577	0,727	0,901	1,11	1,38	1,73	2,25	3,08	4,70	9,54
0-10	0,010	0,116	0,224	0,336	0,458	0,591	0,743	0,920	1,13	1,41	1,78	2,31	3,19	4,96	10,6
0-20	0,021	0,126	0,235	0,348	0,471	0,606	0,759	0,939	1,16	1,44	1,82	2,38	3,31	5,24	11,9
0-30	0,031	0,137	0,246	0,360	0,483	0,620	0,776	0,959	1,18	1,47	1,86	2,45	3,44	5,56	13,6
0-40	0,042	0,148	0,257	0,372	0,496	0,635	0,793	0,979	1,21	1,50	1,91	2,52	3,58	5,91	15,9
0-50	0,052	0,158	0,268	0,384	0,510	0,649	0,810	1,00	1,24	1,54	1,96	2,60	3,73	6,31	19,1
0-60	0,063	0,169	0,279	0,396	0,523	0,664	0,827	1,02	1,26	1,58	2,02	2,69	3,90	6,77	23,9
0-70	0,073	0,180	0,291	0,408	0,536	0,680	0,845	1,04	1,29	1,61	2,07	2,78	4,07	7,30	31,8
0-80	0,084	0,191	0,302	0,420	0,550	0,695	0,863	1,06	1,32	1,65	2,12	2,87	4,26	7,92	47,7
0-90	0,094	0,202	0,313	0,433	0,564	0,711	0,882	1,09	1,35	1,69	2,18	2,97	4,47	8,64	95,5

Table - Sines of Angles

(Angles in mils every 0-10 mils)

Mils	0-00	1-00	2-00	3-00	4-00	5-00	6-00	7-00	8-00	9-00	10-00	11-00	12-00	13-00	14-00
0-00	0,000	0,105	0,208	0,309	0,407	0,500	0,588	0,669	0,743	0,809	0,866	0,914	0,951	0,978	0,994
0-10	0,010	0,116	0,218	0,319	0,416	0,509	0,596	0,677	0,750	0,815	0,871	0,918	0,954	0,980	0,995
0-20	0,021	0,125	0,229	0,329	0,426	0,518	0,605	0,685	0,757	0,821	0,876	0,922	0,957	0,982	0,996
0-30	0,031	0,136	0,239	0,339	0,435	0,527	0,613	0,692	0,764	0,827	0,881	0,926	0,960	0,984	0,997
0-40	0,042	0,146	0,249	0,349	0,445	0,536	0,621	0,700	0,771	0,833	0,886	0,930	0,963	0,986	0,998
0-50	0,052	0,156	0,259	0,358	0,454	0,545	0,629	0,707	0,777	0,839	0,891	0,934	0,966	0,988	0,998
0-60	0,063	0,167	0,269	0,368	0,463	0,553	0,637	0,714	0,784	0,844	0,896	0,937	0,969	0,989	0,999
0-70	0,073	0,177	0,279	0,378	0,473	0,562	0,646	0,722	0,790	0,850	0,900	0,941	0,971	0,991	1,000
0-80	0,084	0,187	0,289	0,388	0,482	0,571	0,654	0,729	0,797	0,855	0,905	0,944	0,974	0,992	1,000
0-90	0,094	0,198	0,299	0,397	0,491	0,579	0,661	0,736	0,803	0,861	0,909	0,948	0,976	0,993	1,000

Table for Resolution of Ballistic Wind into Components

Wind Direction (Wind Angle)				Wind Velocity, m/sec																		
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Component Signs Range / Cross wind				Numerator - Range Component Denominator - Cross Component																		
− / +	+ / +	+ / −	− / −																			
0	30	30	60	1/0	2/0	3/0	4/0	5/0	6/0	7/0	8/0	9/0	10/0	11/0	12/0	13/0	14/0	15/0	16/0	17/0	18/0	19/0	20/0
1	29	31	59	1/0	2/0	3/0	4/0	5/1	6/1	7/1	8/1	9/1	10/1	11/1	12/1	13/1	14/1	15/2	16/2	17/2	18/2	19/2	20/2
2	28	32	58	1/0	2/0	3/1	4/1	5/1	6/1	7/1	8/2	9/2	10/2	11/2	12/2	13/3	14/3	15/3	16/3	17/4	18/4	19/4	20/4
3	27	33	57	1/0	2/1	3/1	4/1	5/2	6/2	7/2	8/2	9/3	10/3	10/3	11/4	12/4	13/4	14/5	15/5	16/6	17/6	18/6	19/6
4	26	34	56	1/0	2/1	3/1	4/2	5/2	5/2	6/3	7/3	8/4	9/4	10/4	11/5	12/5	13/5	14/6	15/7	16/7	16/7	17/8	18/8
5	25	35	55	1/0	2/1	3/2	3/2	4/2	5/3	6/3	7/4	8/4	9/5	10/6	10/6	11/6	12/7	13/8	14/8	15/8	16/9	16/9	17/10
6	24	36	54	1/1	2/1	2/2	3/2	4/3	5/4	6/4	6/5	7/5	8/6	9/6	10/7	11/8	11/8	12/9	13/9	14/10	15/11	15/11	16/12
7	23	37	53	1/1	1/1	2/2	3/3	4/3	4/4	5/5	6/5	7/6	7/7	8/7	9/8	10/9	10/9	11/10	12/11	13/11	13/12	14/13	15/13
8	22	38	52	1/1	1/1	2/2	3/3	3/4	4/4	5/5	5/6	6/7	7/7	7/8	8/9	9/10	9/10	10/11	11/12	11/13	12/13	13/14	13/15
9	21	39	51	1/1	1/2	2/2	2/3	3/4	4/5	4/6	5/6	5/7	6/8	6/9	7/10	8/11	8/11	9/12	9/13	10/14	11/15	11/15	12/16
10	20	40	50	0/1	1/2	2/3	2/3	2/4	3/5	4/6	4/7	4/8	5/9	6/10	6/10	6/11	7/12	8/13	8/14	8/15	9/16	9/16	10/17
11	19	41	49	0/1	1/2	1/3	2/4	2/5	2/5	3/6	3/7	4/8	4/9	4/10	5/11	5/12	6/13	6/14	7/15	7/16	7/16	8/17	9/18
12	18	42	48	0/1	1/2	1/3	1/4	2/5	2/6	2/7	2/8	3/9	3/10	3/10	4/11	4/12	4/13	5/14	5/15	5/16	6/17	6/18	6/19
13	17	43	47	0/1	0/2	1/3	1/4	1/5	1/6	1/7	2/8	2/9	2/10	2/11	2/12	3/13	3/14	3/15	3/16	4/17	4/18	4/19	4/20
14	16	44	46	0/1	0/2	0/3	0/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	2/15	2/16	2/17	2/18	2/19	2/20
15	15	45	45	0/1	0/2	0/3	0/4	0/5	0/6	0/7	0/8	0/9	0/10	0/11	0/12	0/13	0/14	0/15	0/16	0/17	0/18	0/19	0/20

Note. The plus sign (+) signifies that there is a following wind (or cross wind from left to right). The minus sign (−) signifies a head wind (or cross wind from right to left).