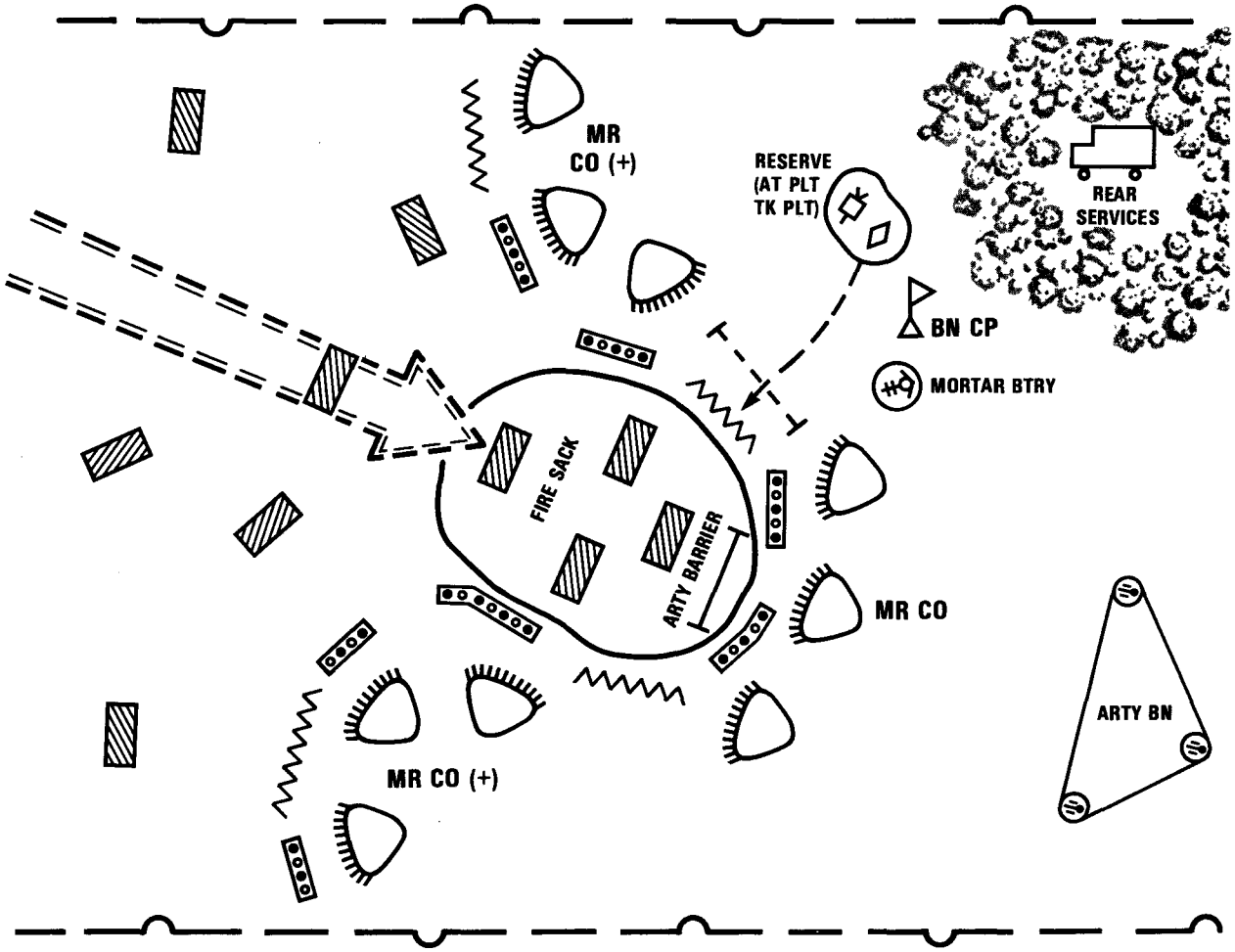
meters between tanks in defensive positions. The terrain is a dominant factor in positioning tanks and antitank weapons. Each tank and antitank weapon has a primary and secondary sector of fire as well as primary and alternate positions.

Barrier plans and the system of fire complement each other. Both antitank and antipersonnel minefields are laid forward of the FEBA and throughout the depth of defensive positions. Antitank obstacles are covered by direct and indirect fires. Shown below is an example of a typical defense by a reinforced motorized rifle battalion.

The Soviets constantly emphasize that the defense is a temporary form of combat that makes the transition to the offense easier. This transition can be made, however, only when each level of command is able to counterattack. The Soviets stress that counterattacks should be made when the enemy attack is stalled and he is unable to secure the terrain seized and to bring his reserves forward.

Typical Defense by a Motorized Rifle Battalion (Reinforced)



NOTE: A battalion usually defends in a single echelon, in an area 3 to 5 kilometers wide and up to 2 kilometers deep. When defending a narrow frontage or if greater depth is required, it may deploy in two echelons as above. Distance between echelons can be up to 500 meters in depth. Reserves are located behind the second echelon.

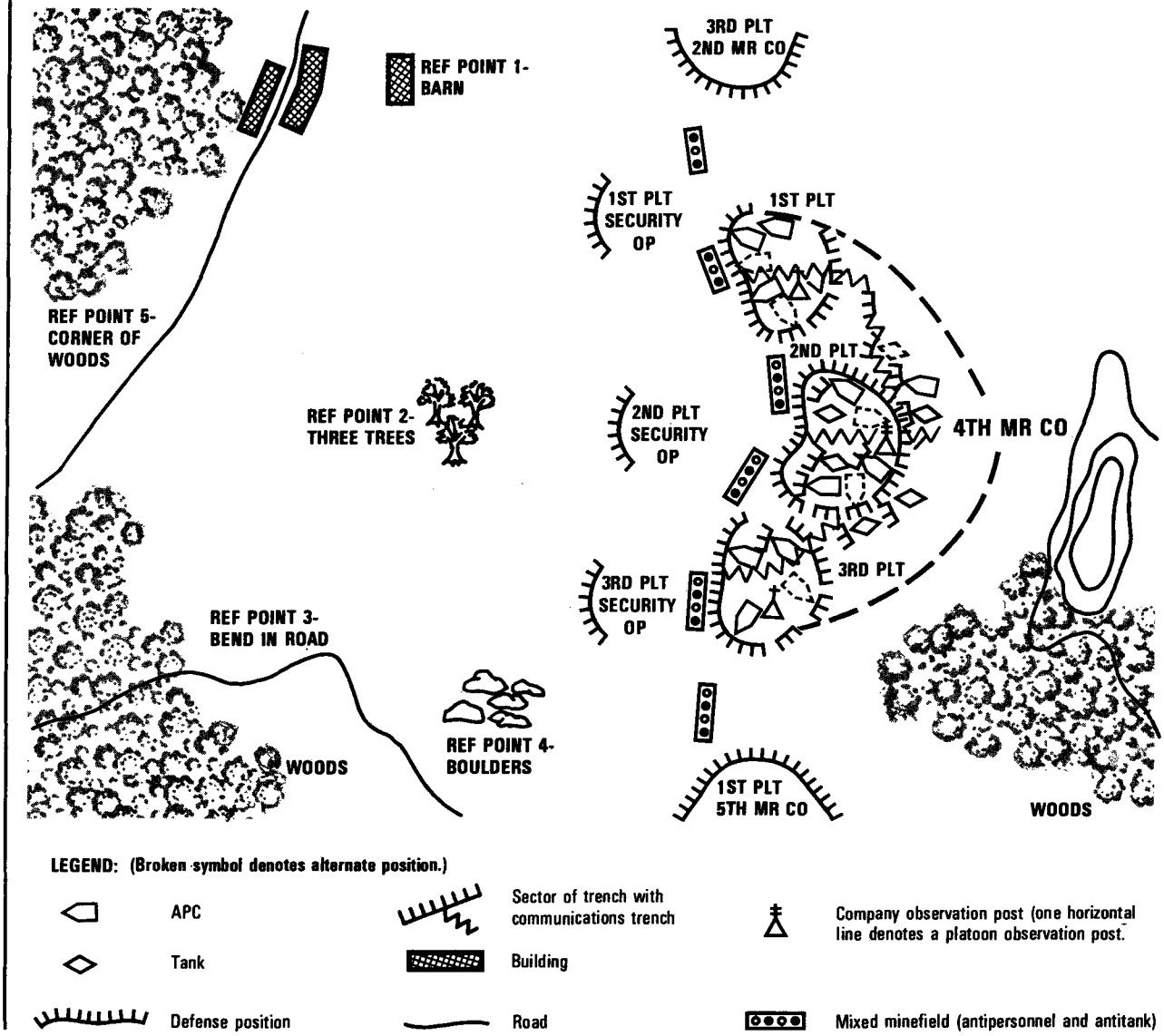
LEGEND:

- Mixed minefield (antipersonnel and antitank)
- Barrier
- Preplanned artillery concentration
- Probable enemy avenue of approach

Each level of command is prepared to conduct a counterattack. If the enemy's forces and fires overwhelm the Soviets' first echelon defenses and prevent them from conducting a counterattack, subunits hold their position, strike the enemy with all available fires, and create sufficient resistance for a counterattack by forces of the next higher command. As the enemy advances into the depths of the Soviet defense, he advances on positions that have been better prepared; and he encounters progressively larger, more powerful (primarily tank-heavy) second echelon formations, which act as counterattack forces.

As previously discussed, the Soviets emphasize dispersion into company-sized strongpoints, while maintaining mutual fire support as a defense against tactical nuclear weapons. By forming company strongpoints, adequate maneuver space is created to shift forces and to counterattack once the enemy's main attack is determined. The strongpoint is usually centered on the platoon in the second main trench.

A Motorized Rifle Company Strong Point



The next higher commander authorizes a counterattack to be launched. In most cases, counterattacks are initiated from the flanks. Counterattacks are preceded by intense air and artillery fires and the fires of adjacent units. The counterattack force attacks from the march. Counterattacks at army or division levels may be the opening phase of a Soviet counteroffensive.

WITHDRAWAL

The Soviets view the withdrawal as a combat action designed to disengage troops from attack by superior enemy forces. The experiences of World War II taught the Soviets the complicated nature of retrograde operations under pressure. On the modern battlefield, a withdrawal will bring the full application of the enemy's combat power to destroy withdrawing units. The Soviets can be expected to resort to deception, movement at night and during periods of reduced visibility, and covert preparations to avoid alerting the enemy.

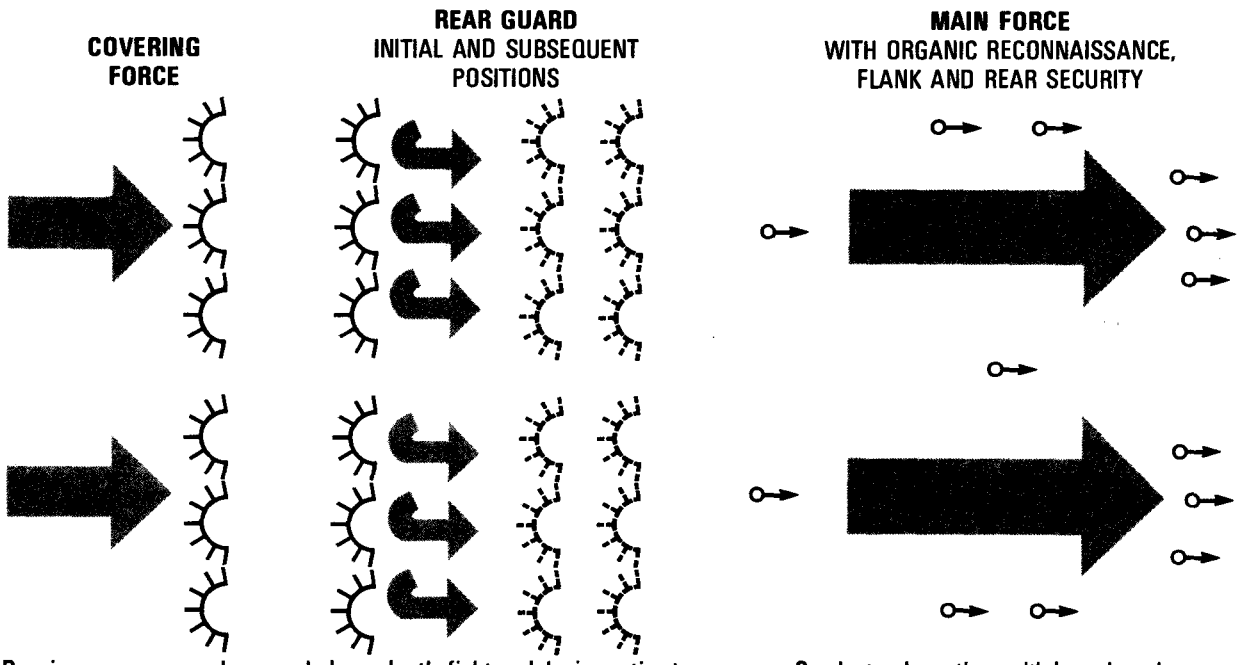
The Soviet commander's withdrawal order is detailed and includes the mission, routes, formation to be used, delay positions, control measures, and information on the new defensive position. Withdrawals are organized and executed under strict secrecy and security. The mission is to disengage the force in a timely, organized manner without losing its combat capability. The force executing the withdrawal is divided into three groups.

The *covering force* has the mission to deceive the enemy and to cover the initial withdrawal of the main body. This force normally comes from units along the forward edge of the defense. It normally consists of a reinforced platoon from each forward-deployed company.

The *rear guard* covers movement of the main body and fights a delaying action if the enemy attempts to maintain contact in the pursuit. It is organized to fight independently of the main body and covering force. Normally, it is organized as a combined arms force consisting of tank, motorized rifle, artillery, and engineer elements. Maximum use is made of artillery, mortar, and long-range ATGM fires through a series of delay positions to prevent enemy interference in the withdrawal of the main body.

The *main body* breaks contact and attempts to withdraw without disclosing its intentions to the enemy.

Basic Concept of the Withdrawal



Deception may be achieved by withdrawing under the cover of darkness or adverse weather conditions, by using supporting fires to cover noise, or by employing a ruse. A route reconnaissance and a reconnaissance of the new positions to be occupied are conducted and guides posted to expedite movement. Air strikes and artillery support are closely coordinated and planned to cover the withdrawal.

A regiment conducts a withdrawal in the following sequence:

- First echelon battalions designate platoons to act as covering forces which attempt to portray a normal defensive posture to the enemy.
- The regimental commander designates a rear guard, normally a reinforced second echelon battalion.
- On order, the main body (first echelon battalions, minus covering forces, plus support elements) withdraws through the rear guard, in the following order: rear services first, then combat support elements, and finally the maneuver subunits.
- The main body proceeds, without pause, on multiple routes, all the way back to a new defensive position or assembly area.

Once the main body has completely passed through the rear guard, the covering force breaks contact on order and withdraws through the rear guard to join the main body. Minimum radio communications or listening silence is observed.

The rear guard fights a delaying action, leapfrogging to successive positions, using to the maximum:

- Smoke.
- Mobile obstacle detachments to lay minefields and to create obstacles across enemy avenues of approach.
- Artillery fire concentrations.
- Ambushes.
- Attack helicopters.
- Fixed-wing air strikes.

If the enemy does not pursue, the rear guard assumes march formation and joins the main body as quickly as possible.

RELIEF

The Soviet term "relief of troops" involves an organized transfer of positions, areas, and zones in a combat situation from one unit to another. The units being relieved have usually sustained considerable losses and are on the defense. A relief also may be conducted to enable a fresh unit to occupy the defense positions of the relieved unit in preparation for a renewed offensive. Because units being relieved are normally in direct contact with the enemy, they are subject to enemy fire and ground attacks. The relief is carefully organized and is executed quickly and secretly. It attempts to preserve as much of the unit's combat capability as possible. As a rule, a relief is conducted at night or during periods of reduced visibility.

Soviet doctrine stresses the temporary nature of the defense and emphasizes the need for counterattacks as soon as it is feasible to initiate a renewed offensive. The relief operation is a means to achieve this end.

A battalion relief usually is conducted with the regimental commander establishing the relief sequence. The two battalion commanders (the one relieving and the one being relieved) conduct a joint reconnaissance of the defensive position. During this reconnaissance, they coordinate routes to and from the relief areas, traffic regulation posts, locations for guides to meet the relieving units, and the sequence of relief. In addition, the battalion commanders review the present system of fire and observation as well as obstacles and minefields that have been prepared for the position.

The commander of the battalion which is being relieved specifies to his subordinates the following:

- The sequence of turnover of the defense area.
- Assembly area(s) after the relief.
- Camouflage and security measures.
- Instructions for guides to meet and accompany the arriving relief units.
- The location of traffic regulation posts.
- The times for commencing and completing the relief.
- Actions in the event of an enemy attack during the relief.

The commander of the battalion which is being relieved exercises overall control until the relief is completed. Should the enemy attack during the relief, the relieving battalion, under the command of the outgoing battalion commander, attempts to repel the attack.

At the appointed time, the relieving battalion moves to the relief area by concealed routes. The relief is carried out successively by platoons. The first to be relieved are motorized rifle and antitank subunits. They are followed by mortar, artillery, and tank subunits. Tanks may be reassigned and left in place if the relief is carried out by battalions of the same motorized rifle regiment. Once in position, the relieving subunits establish observation posts and their system of fire.

Relieved commanders transfer their positions, provide information on enemy activities and routines, and acquaint relieving commanders with the location of obstacles, minefields, and primary directions of fire. Established communications are maintained, and wire lines are left in place and passed on to relieving units.

All engineer installations, to include minefields and obstacles, are thoroughly checked and verified with respect to boundaries, passages, and degree of readiness.

If the enemy attacks, all available subunits—under the command of the commander being relieved—are used to repulse the attack. The reserve of the subunit being relieved may be used to counterattack. It is the last element to be withdrawn from the defensive area.

The relieving battalion commander checks the locations and weapon positions of his subunits to insure they are prepared for combat. The relieving battalion attempts to maintain the same routine and level of activities that existed before the relief. When the relieving commander reports to his superior that the relief is completed, the relief is officially terminated. The relieved battalion withdraws to assigned assembly areas and carries out its subsequent assigned mission.

CHAPTER 7

RECONNAISSANCE

The tactical concepts of Soviet ground forces require timely, accurate, and continuous information on the enemy, terrain, and weather. Reconnaissance, as defined by the Soviets, is the collection of information about the location, activity, disposition, composition, size, armament, combat readiness, and intentions of the enemy. The Soviets recognize that reconnaissance will be met by enemy countermeasures and deception. They employ multiple, overlapping collection means to insure success of their reconnaissance efforts.

Principles of Soviet Reconnaissance

- *Aggressiveness.* The decisive actions and initiative used by commanders and headquarters to obtain necessary information by all means available.
- *Continuity.* The conduct of reconnaissance at all times regardless of the intensity of combat, time of day, or weather conditions. Established contact with the enemy must not be broken and observation must be continuously maintained.
- *Timeliness.* The gathering and reporting of reconnaissance information in sufficient time to counter enemy actions.
- *Reliability.* The degree to which the intelligence information accurately portrays the enemy situation. This involves verifying the intelligence with data from other sources and assigning additional reconnaissance missions to confirm or deny the information.
- *Accuracy.* The accurate determination of coordinates of important enemy targets such as missile installations, nuclear capable artillery, nuclear storage sites, etc.

ELEMENTS USED IN RECONNAISSANCE

The effective ranges of the reconnaissance means at *front* level vary at each level of command. These ranges are also dependent on weather and terrain.

Aerial reconnaissance by high performance aircraft normally is conducted by aviation units at front and army level. Aviation units conduct visual, photo, and electronic intercept and direction-finding reconnaissance missions. Ranges of reconnaissance aircraft vary. Missions of 350 to 400 km usually are flown by pairs of aircraft to support armies or divisions. Long-range missions in excess of 400 km also are flown in support of *front* operations. Visual reconnaissance is a secondary mission of all aircraft in the divisional tactical area. In-flight observations are transmitted to the maneuver elements on the tactical air net.

Helicopters flying in the vicinity of the FEBA depend on local air superiority. When air superiority is denied, helicopters are used to emplace observation posts or reconnaissance patrols rather than perform as air reconnaissance platforms. All helicopters performing any missions may be expected to pass tactical information to those headquarters and units with whom they have radio communications.

From *front* to regiment, there are chemical defense units which monitor nuclear and chemical contamination. Chemical defense troops from these units provide direct combat support to the maneuver units down to company level. Equipped with radiological-chemical reconnaissance vehicles, these troops monitor radiation and chemical agents and mark contaminated areas. Helicopters or fixed-wing aircraft also may conduct NBC reconnaissance.

Soviet artillery from *front* to division has organic target acquisition units which obtain and transmit meteorological and topographic information. The division artillery regiment has a target acquisition battery which gathers information from a topographic survey platoon, sound/flash ranging platoon, a reconnaissance platoon, a surveillance radar section, and a meteorological section.

Engineer units from *front* to regimental level may be used in reconnaissance detachments. Engineer specialists normally accompany maneuver unit reconnaissance patrols. The Soviets are particularly aware of the need for engineer intelligence to assist in maintaining a rapid rate of advance. The reconnaissance resources of the division's combat engineer battalion also include mine detection equipment and the means for detailed bank and bed survey of water obstacles.

Airborne or airmobile forces may be employed behind enemy lines to locate enemy headquarters, communications systems, and nuclear weapons. They also may be given the mission to attack these targets.

Radio intercept and radio direction finding are the primary electronic means of gathering enemy intelligence. Radio intercept is the ability to monitor and understand message content. Radio direction finding is designed to locate broadcast stations.

Medical reconnaissance is conducted to identify areas potentially dangerous to health, including the presence of biological agents.

Rear services officers reconnoiter and establish observation posts to facilitate recovery and repair of damaged equipment, to identify sites for forward supply points, and to determine local sources of supply.

CONTROL OF RECONNAISSANCE ELEMENTS

Soviet divisions and regiments have dedicated reconnaissance organizations, i.e., a reconnaissance battalion for the division and a reconnaissance company for the regiment. These units gather and produce intelligence which will assist the accomplishment of the division and the regimental mission. At division, reconnaissance elements are controlled by the chief of reconnaissance and supported by a small staff. The division's long-range reconnaissance company can operate up to 100 km forward of the main body; other elements of the battalion operate up to 50 km forward. Regimental reconnaissance company elements may operate up to 25 km forward and closer once contact is established.

During tactical movement, a divisional reconnaissance battalion usually moves one or more hours ahead of leading elements of the division. The division normally moves on two or more routes and the reconnaissance battalion organization depends on the division formation. The battalion may form one or two reconnaissance groups and several patrols; however, this depends on the combat situation and the overall mission of the division. Even when the reconnaissance battalion advances on more than one route, movements of each element are controlled by the battalion commander. At each successive objective, he establishes a reconnaissance base from which he directs the employment of reconnaissance groups and patrols operating in advance of the base. Radio contact is maintained with the division headquarters. The battalion commander is expected to be able to implement supplementary reconnaissance missions or to make changes in the direction or rate of advance. He is also expected to request additional support from the main body if his unit becomes too heavily engaged with an enemy unit.

Generally, elements of the battalion seek to avoid sustained combat with an enemy force. They cross open areas at high speeds and cross closed and broken terrain by bounds, moving from one vantage point to another. At the vantage points, they may dismount from the vehicles to get better observation. Upon contact with an enemy element, reconnaissance subunits attempt to use feints and flanking maneuvers to determine the strength, composition, and disposition of enemy elements. Whenever possible, reconnaissance subunits bypass enemy groupings and continue the advance along the prescribed route.

Engineer reconnaissance detachments and chemical defense specialists usually accompany reconnaissance patrols at division and regiment. Other specialists accompany reconnaissance patrols as needed.

Typical Reconnaissance Patrol Tasks

- Identify, locate, and report on enemy headquarters, nuclear weapon systems, troop locations, communication centers, and movement of enemy units.
- Determine the disposition of enemy defenses, locate enemy boundaries and artillery positions, and provide topographical information on approaches to enemy defensive positions.
- Report enemy emplacement of demolitions and the location of minefields.
- Determine obstacle-crossing sites and provide hydrographic information on water obstacles.
- Monitor areas of suspected NBC contamination.
- Identify routes for advance, withdrawal, and lateral communications.
- Identify key terrain.
- Identify possible sites for friendly communication installations.

RECONNAISSANCE ORGANIZATIONS

To obtain timely intelligence Soviet commanders sometimes organize and dispatch *reconnaissance* groups. These groups may be formed by the commander from army through regiment. A reconnaissance group is a temporary tactical subunit formed for the execution of a specified reconnaissance mission. The composition of such groups, usually reinforced platoons or companies, depends on the situation and the assigned mission. In an attack, a division could form a reconnaissance group consisting of a motorized rifle company, reinforced with a platoon of tanks and engineer and NBC reconnaissance squads. Reconnaissance groups conduct reconnaissance by observation as well as by more active methods such as ambushes and raids. In an extreme case, they may destroy covering subunits of a withdrawing enemy. Along with their primary reconnaissance mission, they may be assigned missions to destroy enemy means of nuclear attack and

to seize and hold important terrain features in the enemy rear until the arrival of the main attacking force.

A *reconnaissance detachment* is a temporary tactical subunit of reinforced company or battalion strength. The basic subunit (motorized rifle or tank) is almost always reinforced with elements of the other arm to make it a balanced combat force. Depending on the mission, specialized reconnaissance elements such as artillery, engineers, or NBC may be assigned or attached. A reconnaissance detachment of battalion strength is assigned a zone approximately 7 kilometers wide and 35 kilometers in depth, or it may be assigned an axis of advance. A reconnaissance detachment fulfills its mission by observation, by ambush, and by direct attack if necessary.

A *separate reconnaissance patrol* is a temporary tactical subunit composed of a reinforced squad or a platoon. It normally is assigned a specific objective and/or route instead of a zone. A squad-sized patrol may operate away from its parent unit at a distance of 8 kilometers during the day and 3 kilometers at night, while a platoon-sized patrol may operate at a distance of up to 15 kilometers during the day and up to 5 kilometers at night. A separate reconnaissance patrol accomplishes its mission by observation, but may engage in limited combat if necessary. Limited combat in this case means that the patrol may use reconnaissance by fire to determine enemy positions when no other means are available. The separate reconnaissance patrol also is frequently used to capture prisoners for intelligence exploitation.

Combat reconnaissance patrols in reinforced small subunit strength are employed to attack known or suspected enemy positions to gain information. Their mission is to cause the enemy to react and thereby reveal his dispositions, strength, and fire plan. The patrol conducts its reconnaissance by feints or demonstrations employing fire and maneuver against actual or suspected enemy positions. These positions generally are assigned to the patrol as reconaissance objectives by the controlling headquarters.

A *reconnaissance in force* is employed when ordinary air and ground reconnaissance activities fail to provide sufficient intelligence on which to base a plan of attack. Like the combat reconnaissance patrol, the reconnaissance in force is intended to force the enemy to expose his defensive system. Its specific objectives are to fix the true trace of enemy defense and to locate troop concentrations and weapons; to determine the enemy defensive fire system and the types and locations of fortifications and obstacles; to locate tactical reserves, boundaries between units, and secondary troop dispositions; to capture prisoners and documents; and to seize and hold important objectives which permit surveillance of the defensive position until the main force attack takes place. The subunit which conducts a reconnaissance in force for a division is normally a reinforced battalion and for regiment, a reinforced company. Reconnaissance in force is conducted to convince the enemy that an all-out attack is under way. The attack is made on a comparatively wide frontage and is accompanied by feints and demonstrations by subunits in contact in other sectors. An artillery preparation normally precedes the assault.

CHAPTER 8

FIRE SUPPORT

CONCEPT

The Soviet concept of fire support embraces all combat support provided to the ground-gaining arms by rocket and artillery troops and aviation using conventional ammunition. Nuclear fires are excluded from this concept. The Soviets consider nuclear weapons to be so powerful that they cannot be said to support the combat operations of the ground-gaining arms. Instead, they constitute a separate and independent element of combat power which can accomplish the missions of destroying major enemy combat formations, command and control facilities, and logistics centers.

Even though Soviet military doctrine distinguishes between fire support and nuclear attack, the two are closely related. First, fire support units must plan and deliver nuclear strikes. Second, they must adjust the fire plan to take into account the effects of nuclear strikes on the enemy. Finally, nuclear strikes greatly affect the tempo of combat activity, which, in turn, influences the type of fire support required (mobile fire support systems, such as combat aircraft, will be more in demand) and the kind of logistics support needed (fuel and ammunition).

Artillery support is planned and coordinated by the chief of rocket troops and artillery (CRTA) assigned to the staff of the supported maneuver element at each level of command. (At regimental level, the artillery staff officer is called the chief of artillery.) The CRTA is not the commander of the organic field artillery unit. Air support normally is planned by the aviation commander and his staff at *front* and army level and coordinated by air representatives at lower levels of command (in some cases down to maneuver battalion) who function as forward air controllers.

FIRE SUPERIORITY

Fire superiority is a firepower advantage over the enemy in the course of a given battle or operation. Fire superiority is a unit's ability to execute its own fire missions successfully while suppressing substantive counterfire by the enemy. The Soviets believe that fire superiority is relatively assured for the side that opens fire first; achieves surprise; renders highly accurate, effective fire; masses fires effectively either through maneuver by fire or maneuver of the fire support means. To achieve and maintain fire superiority, a Soviet unit maintains continuous fire on the fire support means of the enemy, especially his artillery.

In the offense, fire superiority is achieved by fire preparation and normally is maintained during the entire battle. In the defense, fire superiority may be achieved in selected sectors for a given period of time—for example, in a sector selected for a counterpreparation or a counterattack.

TARGET DAMAGE CRITERIA

Target damage is the effect of fires on a given military target and results in total, partial, or temporary loss of the target's combat effectiveness.

Categories of Target Damage

Destruction. A destroyed target has completely lost its combat effectiveness. Prepared defenses are considered destroyed when they are no longer usable without major reconstruction. A point target is considered destroyed when there is a 90 percent probability that it has suffered serious damage. An area target is considered destroyed when it is highly probable (90 percent) that no less than 50 percent of the target's subelements or no less than 50 percent of the target area has suffered serious damage.

Suppression. A suppressed target has suffered sufficient damage to lose its combat effectiveness temporarily or to restrict its ability to maneuver or effect command and control. An area target is considered to be suppressed when it is highly probable (90 percent) that no less than 25 to 30 percent of the target's subelements, or 25 to 30 percent of the target's area, has suffered serious damage.

Harassment. Harassment fire is conducted sporadically to prevent troop movement in the open and to lower the morale of the enemy.

PHASES OF FIRE SUPPORT

Offensive fire support is divided into four phases: fire support for a force's movement forward, fire preparation, fires in support of the attack, and fire accompaniment.

Fire support for a force's movement forward consists of long-range fires designed to protect a force moving from an assembly area to the line of departure.

Fire preparation for the attack or counterattack is the combat support rendered by rocket forces, artillery, and combat aircraft before the attack by maneuver elements. Fires for the preparation are preplanned and may be delivered simultaneously or sequentially. In the offense, the preparation immediately precedes an attack. It also could be used before the introduction of second echelon or reserve forces. In the defense, it is used before the execution of a counterattack. The preparation is intended to destroy and to suppress enemy weapon systems, command and control elements, and troops in the tactical and immediate operational depth of the enemy's defenses. The Soviets strive to achieve fire superiority early in order to deny any real opposition by the enemy.

Fire preparation consists of artillery and air preparation and includes fires from rocket forces, artillery (including mortars), combat aircraft, and sometimes tanks and other direct fire weapons. Targets for the preparation phase are allocated (depending on the target's type, dimensions, degree of fortification, mobility, and depth in the enemy's defenses) to rocket forces, artillery, or aviation.

The length and organization of the preparation will depend on the nature of the enemy's defenses, the type and density of fire support means being used for the preparation, the role of nuclear strikes in the attack plan, and the nature of the ground attack. It could last up to 50 minutes or longer or it could be repeated against well-fortified, deeply echeloned defenses.

The preparation consists of intense artillery and air strikes against nuclear delivery systems, artillery and mortar batteries, antitank weapons, enemy strongpoints, and command and control centers.

Fires in support of the attack are rendered by rocket and artillery forces and combat aircraft during the maneuver unit's assault on enemy defenses. Fire support involves the destruction or suppression of enemy troops and weapon systems forward of friendly attacking troops. This phase is designed to prevent the enemy from restoring fire, command and control, and observation systems that were disrupted during the preparation phase. Fires continue to suppress enemy troop activity and weapon systems and to maintain fire superiority, thereby facilitating the forward movement of assaulting tank and motorized rifle troops.

The fire in support of the attack phase is planned and organized at army, division, and sometimes regimental level. It starts immediately after the end of the fire preparation and continues at least until Soviet attacking units have overrun enemy front-line battalions.

Fire accompaniment is rendered by rocket, artillery, and combat aviation forces to maneuver forces attacking in the depth of the enemy's defenses. Fire accompaniment includes artillery, rocket, and air strikes against troops and weapon systems opposing the attacker's advance as well as against enemy reserves deep in the rear. During this phase, previously established fire superiority must be maintained. Fire strikes must destroy nuclear delivery systems, enemy aircraft remaining on the ground, artillery units, command and control centers, antitank weapon systems, and enemy troops. Fires must keep the enemy from using his reserves for counterattacks and must support the commitment of the attacker's second echelon forces to insure a high rate of speed.

Rocket, artillery, and combat aviation units coordinate mutually supporting fires with each other and with the supported maneuver unit. The fire accompaniment phase begins with the end of the fire support phase and continues until the supported maneuver forces have accomplished their missions.

The Soviets consider fire support (artillery and air) the most decisive element in modern combat. They stress the need to integrate all means of fire support closely and to execute a well-coordinated fire support plan throughout the depth of the enemy's defenses.

FIRE SUPPORT ZONES

The Soviets distinguish between close and long-range fire support zones. The close fire support zone extends as far as the range of the attacker's direct fire weapons—approximately 3 kilometers into the enemy's defenses. Domination of the close fire support battle is important to ensure the destruction of forward defending troops and their supporting weapons.

The depth of the long-range fire support zone has increased greatly since World War II because of improved mobility of modern weapon systems and combat fighting vehicles. In the tactical context (division and lower), the long-range fire support zone extends out to the limit of a division's subsequent (or final) objective. Domination of the long-range fire support battle is very important today because of critical targets such as nuclear weapons and delivery systems deep in the enemy's rear area.

AIR SUPPORT

Air support is extremely important for maintaining a high rate of advance. Maneuver units could outrun their artillery support. Artillery units could outrun their logistic support. In any case, air support is needed to cover and support the advance of maneuver units.

In the past decade, the Soviets have tried to integrate air support into the total fire support effort. Major field exercises feature joint air and ground operations. The quantity and quality of fire support means available to the commander have been increased in recent years.

Helicopters have become increasingly important in execution of both the close and long-range fire support battles and have begun noticeably to influence Soviet thinking about the tactics of ground combat. Combat helicopters provide fire support to tank and motorized rifle units during both the offense and defense. Helicopters are used also for reconnaissance and heliborne operations, as observation platforms for artillery forward observers and as mobile means of control and communications.

The establishment of army aviation has given ground maneuver formations a vertical dimension. The helicopter now provides combined arms and tank armies with a highly maneuverable, versatile platform for reconnaissance, command and control, and fire support. General-purpose and attack helicopter units can move with armies and divisions at the high rates of advance they will seek to achieve in conducting combined arms operations in depth.

FIRE SUPPORT ASSETS

Divisional and nondivisional artillery units are being expanded. Older, towed howitzers are being replaced by self-propelled versions. A 122-mm howitzer battalion is being added to the tank regiment of the tank and motorized rifle divisions. The addition of large-caliber, self-propelled howitzers and long-range multiple rocket launchers to the artillery available to army and *front* commanders greatly enhances their ability to provide area and counterbattery fire support to subordinate divisions as they maneuver at considerable depth in the enemy's rear.

The increasing densities of artillery enable entire battalions to fire missions that were previously fired by individual batteries. Improvements in target acquisition radar allow the Soviets to achieve greater surprise and shorter, more intense fire preparations. Fire missions may be initiated without registration from battalions and batteries. Artillery pieces may be laid using shorter, emergency occupation procedures.

Soviet artillery battalions are beginning to receive electronic field artillery computers. Automation of gunnery computations should help Soviet artillerymen to reduce their mission times and to deploy their firing batteries with more flexibility.

The size of helicopter forces has been expanding at a constant rate. Older combat helicopters are being replaced with newer models equipped with ATGMs that have greater standoff range. Newer attack helicopters can maneuver after missile launch. Assault helicopter tactics are being more closely aligned with ground maneuver unit tactics, while fixed-wing aviation is being reorganized to provide more flexible employment.

Third-generation high-performance aircraft with improved avionics, ECM-ECCM equipment, and increased combat radius and payload have replaced older models. The Soviet Union has in production or development precision-guided munitions (PGM) similar to those deployed by US forces.

The deployment of a wide array of mobile and semimobile air defense missile and gun systems has given ground formations greater freedom of maneuver, while simultaneously freeing aircraft from air defense missions for ground support roles.

TRENDS IN FIRE SUPPORT

Soviet fire support concepts are undergoing considerable modification. The introduction of a significant variety of modern equipment in a relatively short time has raised command, control, and coordination problems. The need to improve interaction between supporting and supported units is constantly emphasized, as officers are exhorted to learn the tactics and the capabilities of the units which comprise the combined arms team.

Present Soviet efforts are directed toward upgrading employment procedures and personnel proficiency to maximize the capabilities of new fire support assets. The Soviet aim is to achieve ever greater rates of advance and deeper penetrations into the enemy's rear, while minimizing the enemy's capability to release destructive power on attacking Soviet forces.

Soviet fire planning and execution are still extremely centralized. While this could be an advantage in the preparation and during fires in support of the attack, it could cause considerable difficulty in the accompaniment phase.

The command and control system for air support is even more centralized than that of the artillery. Communications are limited between air and ground commanders, especially below division level. This is true even in attack helicopter units, where close coordination with ground units is critical. The Soviets recognize the limitations of their present command and control system. They are trying to improve communications equipment and coordination to enhance the ground commander's influence over combat support assets.

CHAPTER 9

ARTILLERY SUPPORT

ARTILLERY ASSETS

In the Soviet ground forces, the branch of rocket troops and artillery is responsible for the following:

- Surface-to-surface guided missiles and free flight rockets of *fronts,* armies, and divisions.
- Field artillery (multiple rocket launchers, field guns, howitzers, and mortars 120-mm and larger).
- Antitank artillery (See Chapter 10).

Motorized rifle units from division to battalion are assigned their own organic field artillery element—an artillery regiment to a division, an artillery battalion to a regiment, and a mortar battery to a battalion. The same is true of the tank division except that the tank battalion has no organic artillery or mortar unit. Both the motorized rifle and tank divisions are assigned their own surface-to-surface missile (SSM) battalion.

The combined arms army, and sometimes the tank army, has an artillery regiment or brigade with at least two long-range gun battalions and a howitzer battalion. The army usually has an SSM brigade and may also have an MRL regiment.

A *front* would contain an artillery division made up of several long-range gun and howitzer regiments/brigades, an MRL brigade, and at least one antitank regiment/brigade. It may be supported by a heavy artillery brigade in addition to the artillery division. A *front* would also have at least one SSM brigade. (For more information on fire support organization, *see FM 100-2-3).*

Allocation Procedures

The following are general procedures for the allocation of artillery by a higher headquarters to a maneuver force for the execution of a given operation:

- *Front* and army normally allocate artillery battalions in accordance with the importance of the missions to be carried out by armies and divisions.
- A division will allocate some of its organic and attached artillery to leading regiments.
- A regiment may attach some artillery to leading maneuver battalions.
- Motorized rifle regiments in a division second echelon normally retain their organic artillery.
- Second echelon divisional artillery may be temporarily attached to first echelon divisions.
- Second echelon divisions, regiments, and battalions are not normally reinforced with additional artillery until they are committed.

Organization for Combat

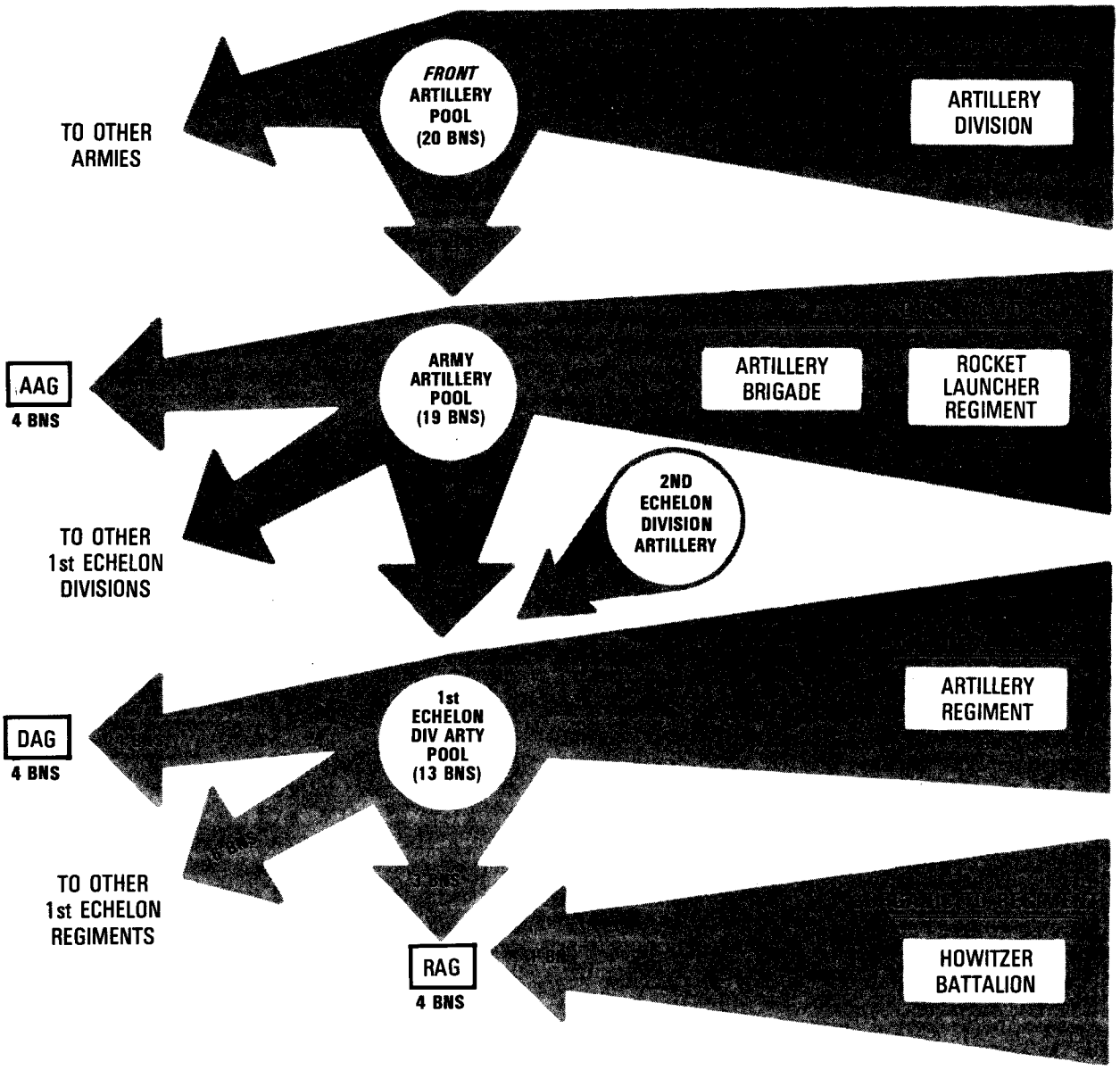
The command and organizational structure, which insures flexibility in concentrating artillery fire, is established by temporary, mission-oriented groupings. Organizing artillery into army, divisional, and regimental artillery groups provides maneuver commanders continuous artillery support with the required degree of centralized control. Artillery groups usually consist of at least two battalions of similar or mixed type units, to include field guns, howitzers, and multiple rocket launchers. Command and control of the group is provided by a designated commander and staff, usually the commander and staff of the artillery regiment or battalion which is the core of the group.

Army Artillery Group (AAG). *Front* artillery assets normally are allocated among committed armies, proportionate to the importance of the assigned tasks. When an army commander receives *front* artillery assets, he decides, based on the concept of the operation, what artillery will be suballocated to his first echelon divisions. The division executing the major army mission gets the most artillery. The remaining artillery battalions may be formed into an AAG which will then assume the primary counterbattery mission for the army.

Division Artillery Group (DAG). The division commander also allocates artillery, resulting in the formation of a DAG and several regimental artillery groups. The division may organize more than one DAG if necessary due to span of control, number of battalions available, and assigned missions. The DAG may vary in size from two to four battalions and is employed in general support of the division. The DAG assists the army with the counterbattery mission or, if capable, may perform this mission itself.

Regimental Artillery Group (RAG). Regimental artillery groups are formed from organic and attached artillery and reinforcing nondivisional artillery battalions assigned to provide support to the first echelon maneuver regiments. Normally RAGs are composed of two to four artillery battalions and temporarily are assigned the numerical designation of the supported regiment. The RAG destroys targets that hinder the advance of the attacking forces. An example of the formation of artillery groups is illustrated on the following page.

Formation of Artillery Groups (Example)



NOTES:

1. The artillery division has 20 battalions of field guns, howitzers, and multiple rocket launchers.
2. In addition to its organic artillery division, the *front* may be allocated a heavy artillery brigade from the Reserve of the Supreme High Command, but these assets are not likely to be suballocated to armies.
3. A first echelon division may receive artillery battalions from a second echelon division.
4. Antitank and SSM battalions are not normally included in artillery groups.
5. The regimental howitzer battalion is part of the RAG.
6. An artillery battalion or battery assigned to a RAG may be further allocated to a motorized rifle or tank battalion.

Artillery groups established for the defense are normally maintained intact until the offense is resumed. Groups formed to support the offense are generally dissolved or reorganized when the supported maneuver units enter the exploitation phase of an operation. DAGs and RAGs are formed or dissolved in accordance with plans and orders of higher headquarters. Through his CRTA, the division commander may assign specific artillery units to provide support to designated maneuver units. In a fluid situation, such as in exploitation or pursuit, artillery support will be provided to lead maneuver units. Through the division command and control net, the division commander retains the ability to form new groups as the situation may require. When groups are dissolved, army and *front* assets may revert to centralized control to provide long-range reinforcement for divisional and regimental artillery.

An artillery battalion or battery assigned to a RAG could be directed to support a maneuver battalion. The release from centralized control would permit the artillery subunit to carry out missions in support of the specific maneuver battalion while remaining subordinate to the RAG. Motorized rifle battalions also have a significant organic capability in the mortar battery. Its deployment is coordinated with that of other artillery weapons, as authorized by the maneuver battalion commander.

COMMAND AND CONTROL

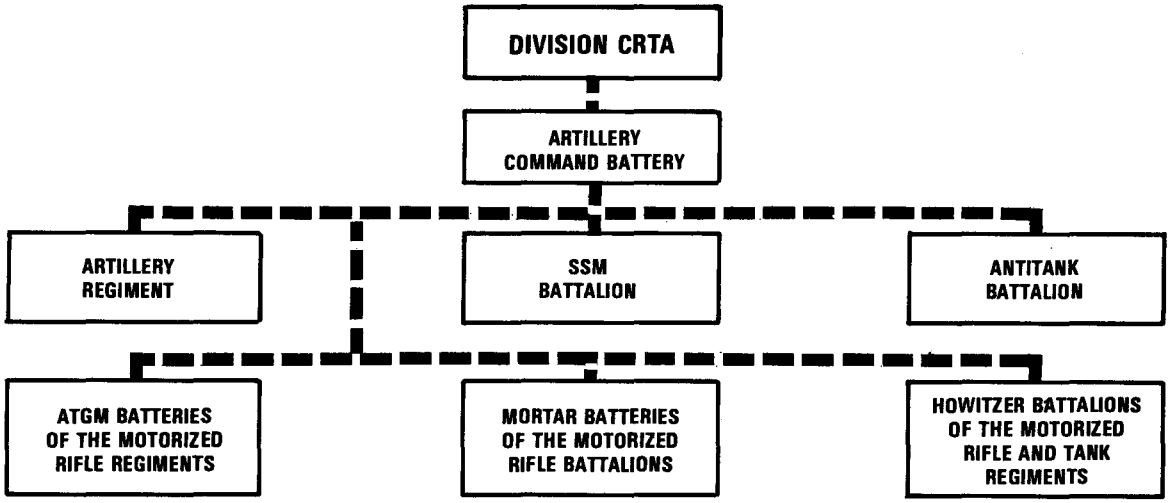
At regiment and above, an artillery officer who plans and coordinates artillery fires serves on the staff of maneuver unit commanders. He is called the chief of artillery at regiment and the chief rocket troops and artillery (CRTA) at division and above. The artillery staff officer (chief of artillery or CRTA) is responsible for controlling the artillery units organic or attached to his maneuver unit, although he does not command them. The commander of the organic artillery unit assigned to the maneuver unit is directly responsible for the performance of his artillery unit.

At maneuver battalion level, the commander of an attached artillery subunit acts as the fire support coordinator to the battalion commander.

The division CRTA controls the division artillery regiment (including the MRL battalion), the SSM battalion, the AT battalion, and the ATGM batteries, mortar batteries, and howitzer battalions of the subordinate maneuver regiments, though he does not command any of these units. The CRTA also has the authority to inspect the artillery units in the division and to hold them accountable for their technical proficiency.

In combat, the artillery groups form the basic framework for the control of artillery fires in the division. Decisions about the employment of artillery are made on a centralized basis. The division commander, with recommendations from his CRTA, exercises

The Role of the CRTA in the Motorized Rifle Division



NOTE: The CRTA coordinates the fires of all the above units through the command battery, though he commands none of the units. The mortar batteries must satisfy the requirements of their battalion commanders, and the howitzer battalions and ATGM batteries must satisfy the requirements of their regimental commanders.

control over all organic and allocated artillery within the division. The following procedures are observed:

- The division commander specifies the artillery organization for combat and the tasks to be carried out by the artillery.
- The CRTA conducts and coordinates fire planning.
- Artillery commanders normally are collocated with the commanders of the supported maneuver force.
- The DAG commanders report directly to the CRTA.
- RAG commanders report directly to the supported maneuver regimental commander while retaining contact with the CRTA.
- Artillery battery and battalion commanders keep their supported maneuver commanders informed and report to their controlling artillery headquarters.

The division CRTA coordinates the artillery fires of the division through the command battery, though he commands none of the units. The mortar batteries must satisfy the requirements of their battalion commanders, and the artillery battalions and ATGM batteries must satisfy the requirements of their regimental commanders.

Command Relationships

An *attached* artillery battalion or battery is under the operational control of the maneuver force commander. A *supporting* artillery battalion or battery remains under the control of its parent artillery organization, with its fires delegated to a particular maneuver force.

An artillery battalion *attached* to a maneuver battalion takes its orders from the maneuver battalion commander. Its batteries can be assigned to support motorized rifle/tank companies, but the battalion still can be called on to support the maneuver regiment and to receive missions from the RAG commander.

A *supporting* battalion remains subordinate to the parent artillery unit or the RAG; but, if it has no regimental missions, it will fire missions for the motorized rifle or tank battalion that it is tasked to support. Its batteries, however, cannot be tasked separately to support subordinate companies of the maneuver unit, even though supporting and supported commanders may be collocated. Thus, a *supporting* artillery battalion will carry out missions for the maneuver battalion only if the RAG commander permits or specifically directs the action.

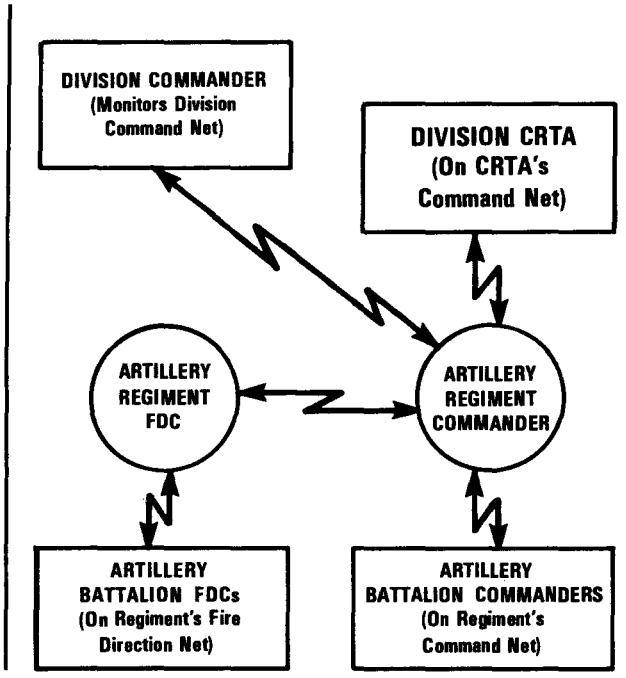
The fire plan of an *attached* battalion will reflect the specific support of the battalion to which it is attached, but the fire plan of a *supporting* battalion will reflect the tasks of the motorized rifle regiment and its RAG. The senior commander who allocates the artillery unit can change the mission of attached or supporting artillery during the course of combat. The period of attachment normally will cover the time needed to accomplish a particular tactical mission. Such a period could vary from a matter of hours to several days.

Coordination and Communications

The artillery commander normally is collocated with the commander of the maneuver unit he is supporting and thereby effects coordination face-to-face. Provision also is made for the artillery commander to enter the VHF (FM) command net of the supported unit. Except when subunits have been detached for special missions, artillery commanders retain rigid control of the deployment of weapons and observation posts to provide continuous artillery support in all phases of combat.

Radio and wire are the primary means of communication, although Soviet artillery units also use messengers as well as visual and sound devices. By regulation, communications are established from senior to subordinate and from supporting unit to supported unit.

Radio Communications of a Division's Artillery Regiment



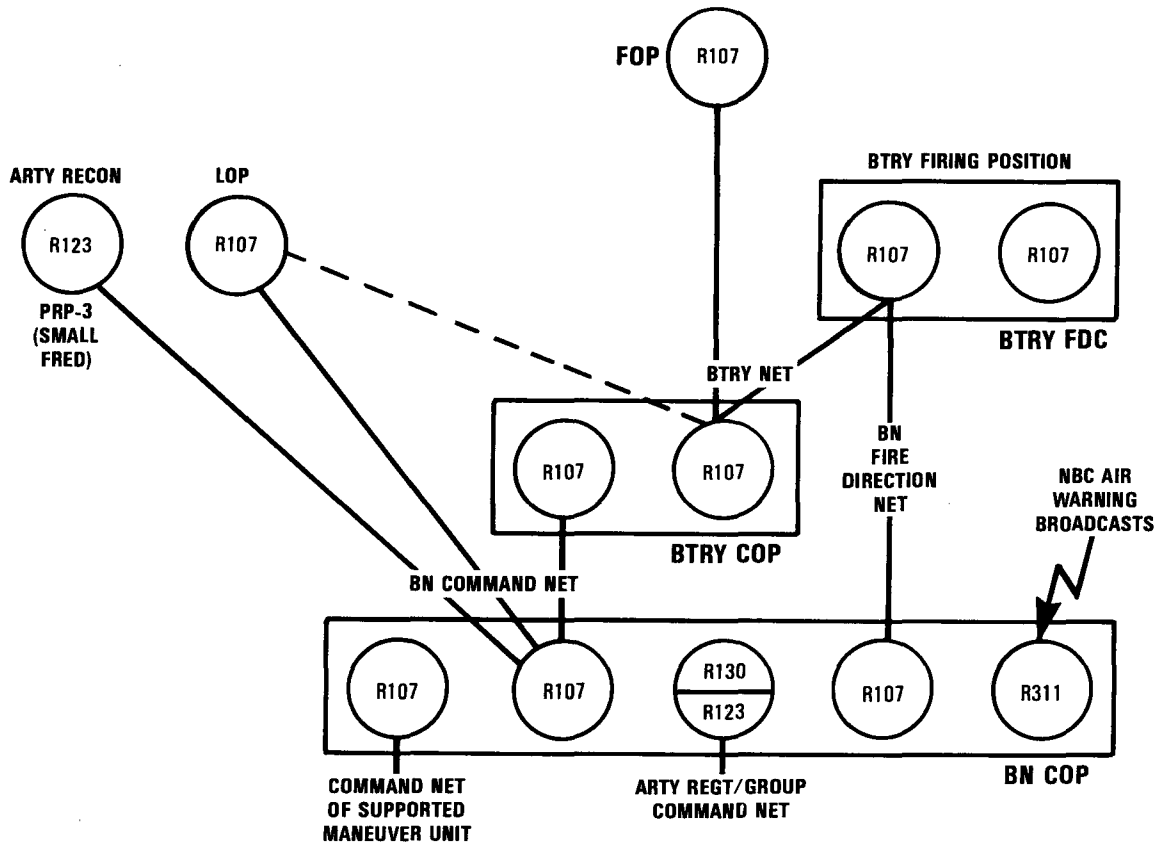
Soviet artillery units may send radio traffic over supported unit command nets, artillery command nets, and fire direction nets. Artillery group command nets (e.g., RAG or DAG) have battalion commanders as substations. Battalion nets have battery commanders and the battalion command observation post as substations. Batteries have their own nets but can switch to the battalion fire direction net if required. The battalion command observation post has direct radio communications with battery firing positions on the fire direction net.

Towed artillery units rely primarily on the R107 (VHF) portable radio for internal radio communications, whereas self-propelled units use the R123 (VHF) vehicular radio, which is installed in every howitzer. At higher levels of command, longer-range HF (AM) radios such as the R130 are also used for artillery command communications.

The Soviets use wire communications whenever subunits remain in one location for any length of time—normally in assembly areas of defensive positions. To provide redundancy, artillery wire nets normally parallel the wire nets of the supported units.

Soviet subunits also use pyrotechnics, especially in coordinating prearranged artillery fire with the advance of attacking maneuver forces. Signal flags are used to acknowledge fire commands at the gun position, for convoy control, and for signaling between the

Towed Artillery Battalion Radio Nets



NOTE: In self-propelled battalions equipped with the new artillery command and reconnaissance vehicles (ACRV), the R123 vehicular VHF radio is used in place of the R107. Besides replacing R107s shown here, the R123 is also found in each self-propelled howitzer. The LOP normally communicates with the BN COP, but may also communicate with the BTRY COP.

firing point and the truck park (prime movers and ammunition carriers) in a battery firing position.

FIRE CONTROL AND TARGET INTELLIGENCE

Observation Posts

Artillery fire is controlled through a network of observation posts. The network of artillery observation posts established in a division zone may include command observation, forward observation, mobile observation, lateral observation, dummy observation, close-in, and alternate observation posts. The number and type of observation posts depend on the mission. During high-speed offensive operations, personnel in these posts often operate out of armored command and reconnaissance vehicles. The most important types of observation posts are discussed below.

The *command observation post* (COP) serves as both an observation post and command post. The COP is located where the artillery commander can observe his zone or sector of fire, study the target area and terrain, follow the progress of friendly forces, and direct or coordinate artillery fires. In most cases it will be collocated with the forward command posts of the supported maneuver unit commander.

The COP normally is manned by the artillery commander, and fire direction, communications, and reconnaissance personnel. Although both battalions and batteries have fire direction centers (FDCs) at the firing position, fire direction computations normally are accomplished at the COP and the FDC simultaneously.

Artillery commanders may establish one or more *forward observation posts* (FOP) to supplement the COP. At the battery and battalion levels, the FOPs are manned by the headquarters platoon leader, a scout, and a radioman. A FOP may be located with the supported unit commander or with one of the advance maneuver elements. FOPs are employed especially in the offense, during combat in the depth of the enemy's defenses. When the COP can no longer cover its zone of responsibility—or if the commander displaces, causing the COP to displace—the FOP assures continuous close fire support for the maneuver forces.

A *mobile observation post* (MOP) may function either as a COP or FOP. The Soviets have a number of artillery command and reconnaissance vehicles (ACRV) that are used as MOPs. The crew of the MOP consists of five men: commander, driver/mechanic, RTO/gunner, navigator, and rangefinder operator. The vehicle contains day/night observation and range-finding equipment, topographic survey equipment, artillery fire direction computer equipment (manual and electronic), and communications equipment. The topographic survey equipment provides constant position data on the vehicle's location. Communication equipment consists of crew intercom, two radio sets, two telephones, and two reels of wire. The latter are used to establish communications with supplemental observation posts that are established by the crew of the mobile observation posts, using instruments carried in the vehicle.

In the offense, the mobile observation post advances closely behind lead motorized rifle or tank subunits, conducting reconnaissance and fire missions on the move or during short halts. During a march, the mobile observation post moves as part of an artillery reconnaissance party in the lead security element of the supported motorized rifle or tank unit. In the defense, mobile observation posts may form part of the combat outposts in the forward security zone.

A *lateral observation post* (LOP) is established in addition to the COP or FOP so that the same sector of the battlefield can be observed from two of the observation posts. At battalion level and higher artillery echelons, the LOP is used for accurately locating targets, reference points, and registration points and for adjusting fire. LOPs also are used to study enemy defenses, dispositions, and activity. The LOP also is used for observing high-burst or center-of-impact registrations. The controlling observation post is usually the COP, and the LOP is situated on the flank in a position that will give good observation of the artillery unit's zone of responsibility.

A *dummy observation post* may be used to confuse the enemy as to the actual position of the COP. After the COP is established and functioning, scout observers construct a dummy COP. They use materials found on the battlefield to simulate radio antennas and other equipment. Although field training regulations call for a dummy observation post, it normally is used only in static situations.

Reconnaissance and Target Acquisition

Observation posts frequently combine several target intelligence capabilities (i.e., flash ranging and visual observation). Lone ground observers can be located in trees or buildings. Air observers may use light observation helicopters such as the Mi-2/HOPLITE.

Artillery reconnaissance patrols are used primarily to locate enemy artillery units, especially those capable of nuclear strikes. The patrols may set up observation posts behind enemy lines to adjust the artillery fire.

They also report on enemy organization and deployment. Intelligence data from other observation posts and stations are transmitted to the COP, which apparently relays them to the firing position.

A target acquisition battery is organic to the Soviet division artillery regiment. This battery and the division reconnaissance battalion provide the bulk of the division's artillery intelligence. The battery subunits include the following:

- Radar section. (This has a mortar- and artillery-locating capability.)
- Sound ranging platoon.
- Surveillance radar section.
- Reconnaissance platoon.
- Topographic survey platoon.
- Meteorological survey section.

The sound ranging platoon is capable of operating a six-microphone sound ranging base that can locate targets up to a range of 20 kilometers in a zone 6 to 8 kilometers wide.

EQUIPMENT

Soviet field artillery is subdivided into field guns, howitzers, mortars, and multiple rocket launchers. Until the mid-1970s, Soviet field artillery was all towed, with the exception of multiple rocket launchers, which are mostly truck-mounted. Towed guns are lightweight, low-cost, and simple. Their disadvantages are lack of cross-country mobility and absence of gun crew protection against nuclear, chemical, or conventional counterbattery strikes. The Soviets continue to bring self-propelled weapons into their field artillery inventory.

Field guns are used by the Soviets for—

- Killing troops in the open.
- Destroying buildings above ground level.
- Engaging of rapidly moving targets.
- Bombarding of distant targets such as artillery batteries, headquarters, and columns moving in the rear areas.
- Destroying tactical nuclear delivery means.

Howitzers are used by the Soviets for hitting indirect targets and for destroying or neutralizing enemy defensive positions. Tank and motorized rifle divisions have three howitzer battalions in their artillery regiment. Each motorized rifle regiment and some tank regiments have one battalion of howitzers. This enables the regimental commander to engage targets of opportunity quickly.

Tracked, *self-propelled (SP) howitzers* have been introduced in recent years, considerably enhancing the Soviet artillery's ability to give continuous support to motorized rifle and tank regiments in a conventional, nuclear, or chemical environment. The SP howitzers are equipped with filtration and overpressure NBC protection systems. Ammunition resupply for self-propelled howitzers is likely to be limited as long as they have to depend on wheeled trucks for logistic support.

The self-propelled howitzers are complemented by a new, tracked, artillery command and reconnaissance vehicle (ACRV). There are two of these ACRVs in each battery, one for the battery command observation post (COP) and one for the battery fire direction center (FDC). Two ACRVs are also assigned to the battalion headquarters. One serves as the battalion COP and one as the battalion FDC. A surveillance variant of the BMP is also in service with the artillery.

The Soviets use *multiple rocket launchers (MRLs)* to deliver strikes at decisive moments in a battle. The MRL is an excellent area coverage weapon. The area covered by a salvo and its rapid ripple fire make it an excellent delivery system for chemical agents.

Each motorized rifle battalion has an organic 120-mm mortar battery. These indirect fire support weapons are also used to assist the regiment in accomplishing its mission. For more information on fire support equipment, *see FM 100-2-3.*

ARTILLERY AMMUNITION

Conventional shells consist of HE, fragmentation, and HE fragmentation types. The HE shells are used for destroying fortifications. Fragmentation shells are intended mainly for attacking personnel and equipment in the open. The HE fragmentation shells are fitted with fuzes for either instantaneous or delayed detonation and are the standard projectiles for all howitzers and guns. A time-delay fuze is also fitted for airburst effects.

The impact area of fragments from one HE fragmentation shell are—

- 122mm: 800 square meters.
- 152mm: 950 square meters.

The sizes of craters caused by one HE shell can vary according to the surface struck, its condition, and also the type of fuze. These are average dimensions for point detonation fuzes striking flat ground:

- 122mm: 1.5 meters at widest point and 0.5 meter maximum depth.
- 152mm: 1.5 meters at widest point and 1.5 meters maximum depth.

Field artillery pieces (152-mm and smaller) have an antitank capability, and about 10 percent of their combat load may be armor-defeating ammunition.

Smoke is used to obscure the view from observation posts and fire positions, especially antitank positions. Smoke shells are most likely to be used when the wind is blowing towards or across the enemy position. Smoke is also used for marking enemy positions, and deceiving the enemy by concealing the size and direction of an attack. (For more information on the use of smoke, *see Chapter 13, FM 100-2-1).*

Illuminating shells are used widely by the Soviets in night combat to observe enemy movements, to acquire targets for all arms, and to provide reference points. The standard illuminating shell lights up an area of up to 1.5-km radius for 30 seconds. One gun firing two to three rounds per minute is required to provide continuous illumination for every 750 to 1,000 meters of frontage. Other types of ammunition include—

- Nuclear.
- HE rocket-assisted projectiles.
- Chemical.
- Incendiary.
- Canister.
- Propaganda.

Planning for ammunition consumption is based on the *unit of fire,* which is a fixed number of rounds per weapon or weapon system that is used for planning and accounting purposes. It is *not* an authorized allowance or daily expenditure rate. For example, the unit of fire for the 122-mm howitzer is 80 rounds. For each operation, planning factors for ammunition expenditure are established in units of fire. Ammunition distribution and stockage also are measured in units of fire.

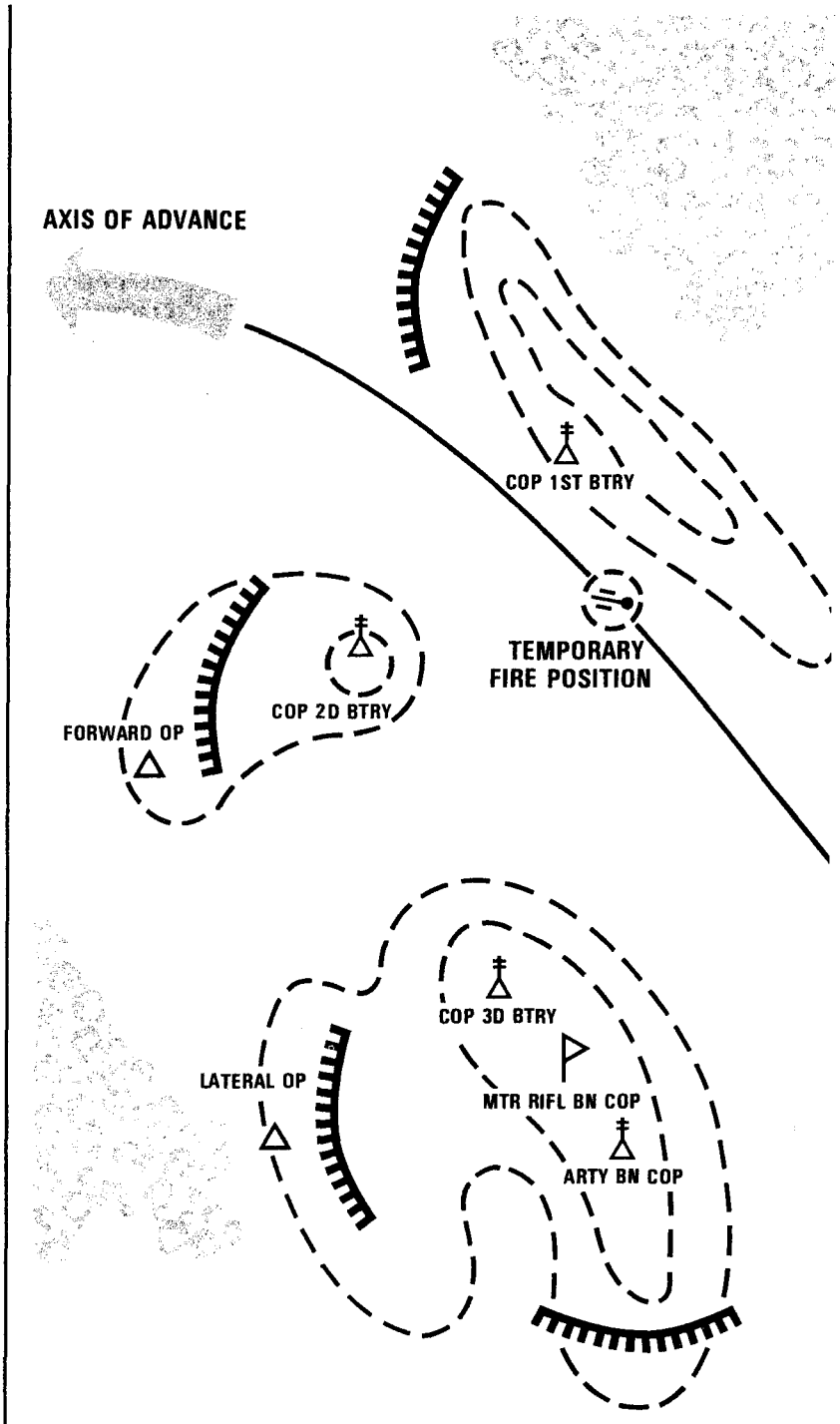
TACTICAL DEPLOYMENT OF AN ARTILLERY BATTALION

Battalion firing positions normally are laid out in the form of a large triangle with three batteries dispersed to each of the three points of the triangle. Normally, batteries in the battalion area emplace 500 to 1500 meters apart. The triangle will form a forward or reverse wedge pointed toward or away from the enemy (see illustration at right).

The battery firing position is selected by the artillery battalion commander. Certain factors must be considered in the selection of a firing position. Wooded areas, foothills, and thickets are the most desirable areas for concealed gun positions. If a concealed position is desired in the vicinity of a heavily populated area, gun positions are located in orchards or garden plots. The entrance to and exit from all gun positions is concealed as much as possible.

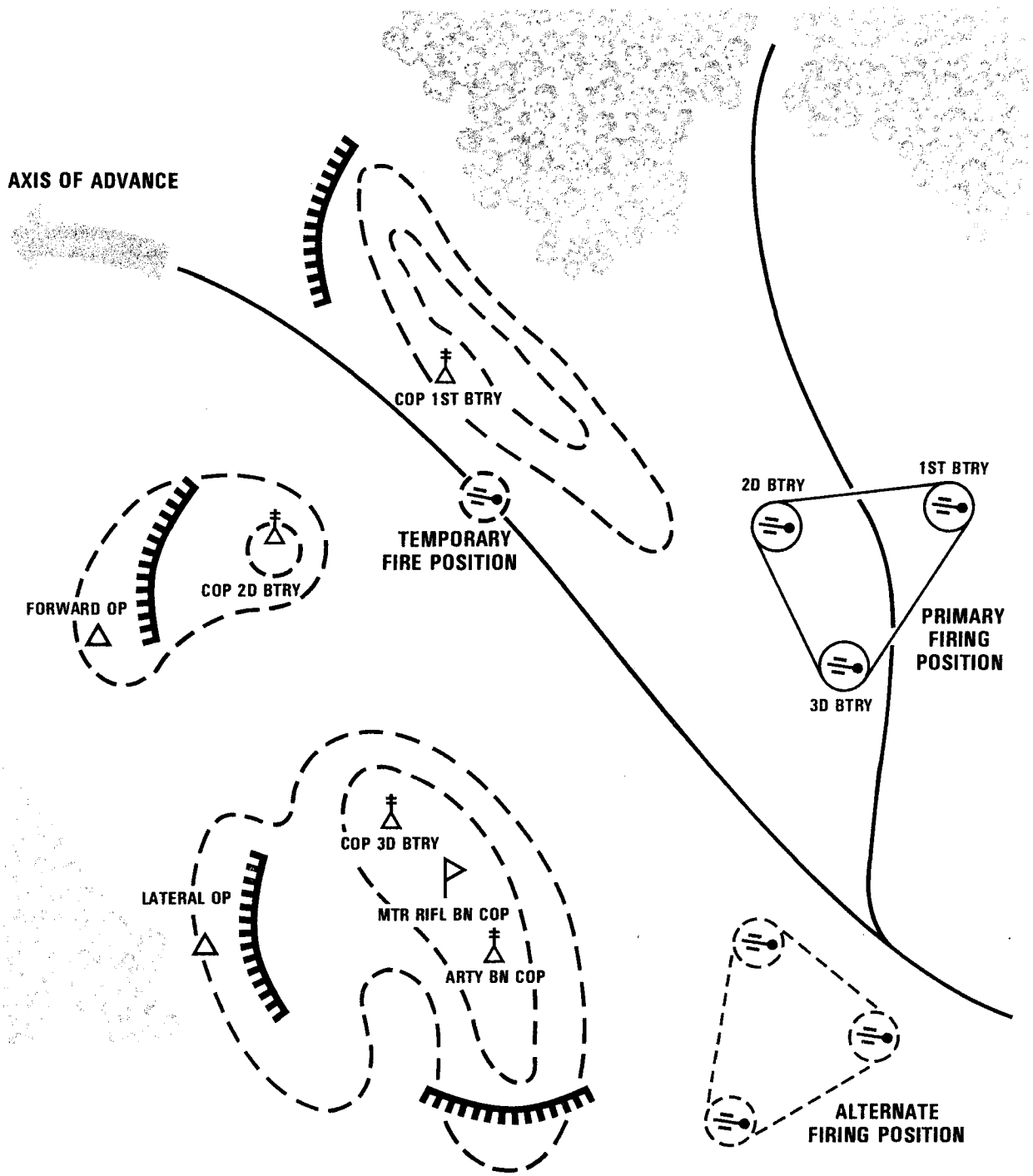
For an unconcealed or open gun position, sufficient range must be allowed for the battery to accomplish a

Combat Formation of an Artillery Battalion



NOTE: Within the battalion firing position, batteries are normally separated from each other by 500 t 1500 meters.

Combat Formation of an Artillery Battalion

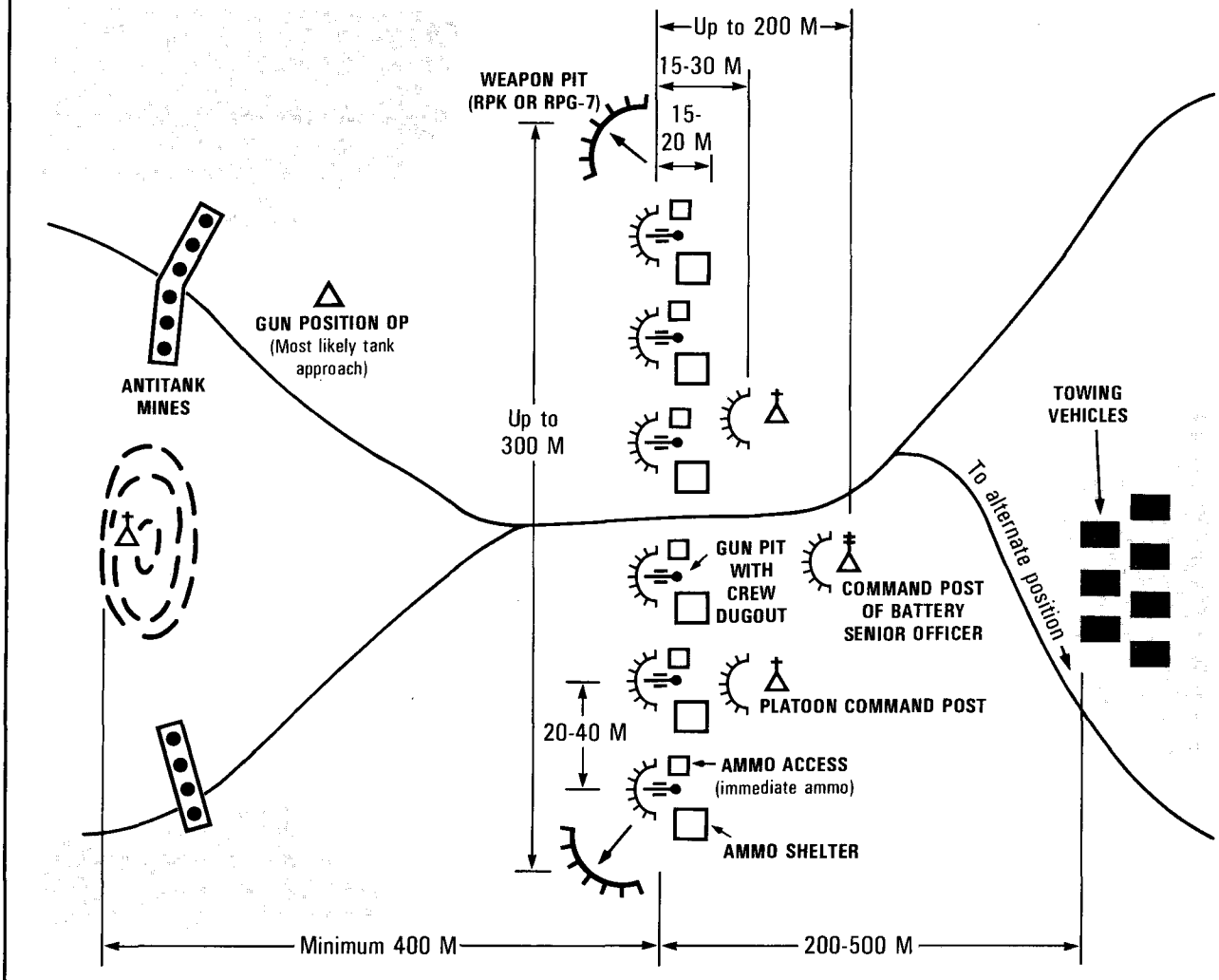


NOTE: Within the battalion firing position, batteries are normally separated from each other by 500 to 1500 meters.

direct fire mission at the weapon's maximum effective direct fire range. The fire position also should afford cover for the gun crews and their ammunition and should have interlocking fires with adjacent weapons. Unconcealed firing positions could be found near fences, thickets, and roads, or in ditches.

Within the batteries themselves, gun positions normally are laid out at right angles to the axis of advance. The battery is deployed in a straight line with equal intervals between guns. This pattern of deployment reduces emplacement/displacement time. It also simplifies the computation procedures required for battery fire missions because it reduces the need for individual piece corrections. The Soviets continue to favor this disposition, despite its obvious vulnerability to enemy counterbattery fire and air attacks, because they rely largely on manual computation in their fire direction procedures. The reduced computation and mission time enables batteries to complete missions and relocate more quickly, thereby reducing their exposure to enemy fire and compensating somewhat for the vulnerability inherent in the formation.

Artillery Battery Firing Position



NOTE: Slit trenches and crew shelters may be dug beside gun pits and command posts. Positions may be linked by communication trenches.

(NOT TO SCALE)

Soviet artillery does use formations that vary the interval between guns and disperse the guns in depth with the aid of electronic field artillery computers. The Chief of Soviet Rocket Troops and Artillery, Marshal Peredel'skiy, indicated in December 1980 that such computers were available and being deployed. Even with computers, the Soviets may retain the linear formation for the sake of speed and simplicity. They are trying to reduce the time that a firing battery remains in position after the first round is fired to as little as 4 minutes. Soviet artillerymen are now required to render effective fire from emergency positions without firing a registration. Under these conditions, the linear deployment retains its utility and attractiveness to Soviet artillery commanders.

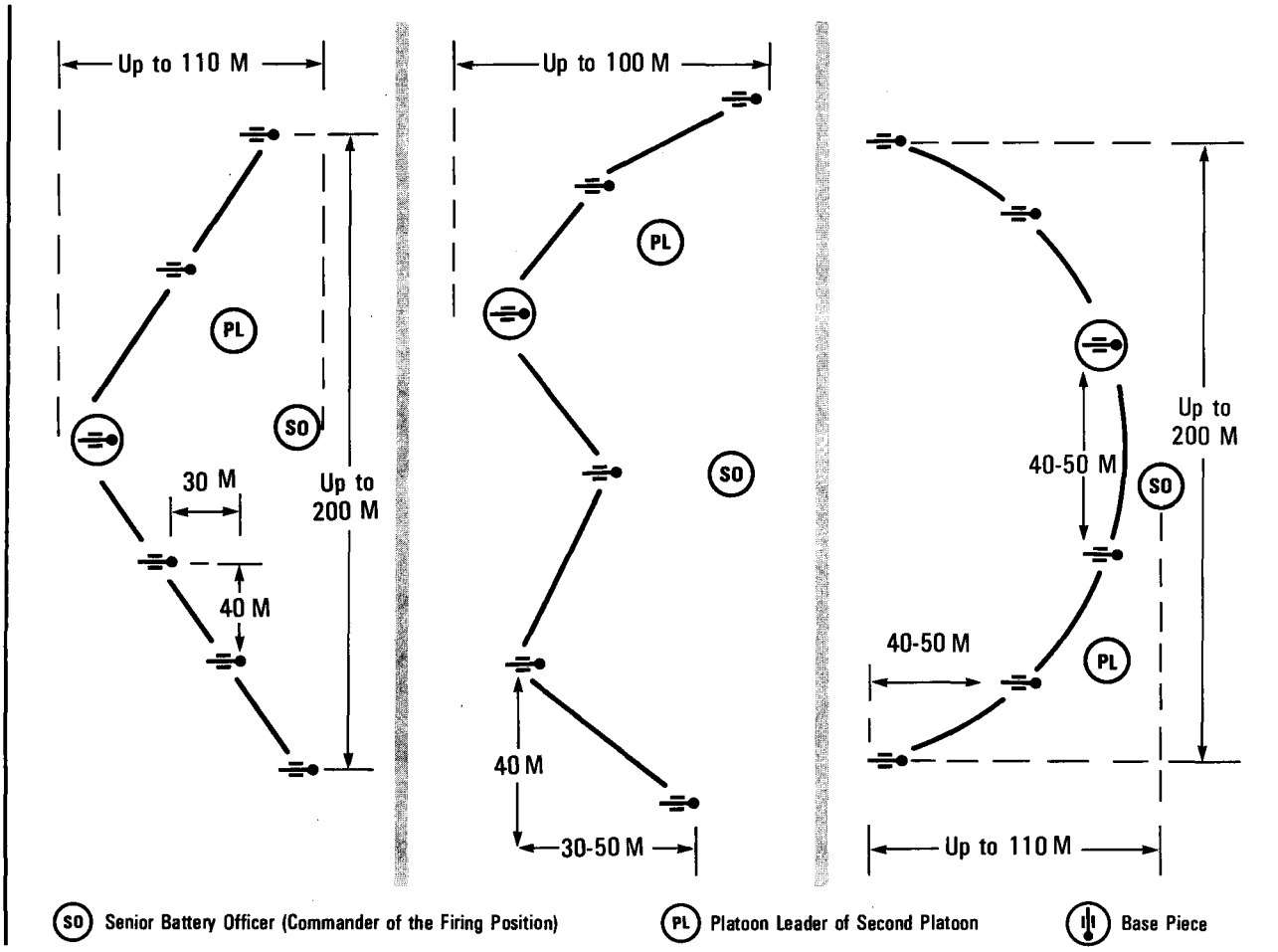
Possible variants in battery firing position deployment are illustrated below.

Main and alternate gun positions are selected for a battery in the offense, but only a main one is used in a meeting engagement. Main, temporary, alternate, and dummy sites are used in defense.

In the offense, minimal work is done on gun positions. When time allows, positions will be developed progressively and camouflage nets may be used to conceal gun pits.

Battery firing positions are organized by platoons (two firing platoons of three guns each). Each platoon has a platoon headquarters and three gun sections. The platoon leader of the first firing platoon is the senior firing position officer and performs most of the functions carried out by the battery executive officer in a US Army howitzer battery. (The battery commander is normally at the COP with the supported unit commander.)

Deployment of a Howitzer Battery (Variants)



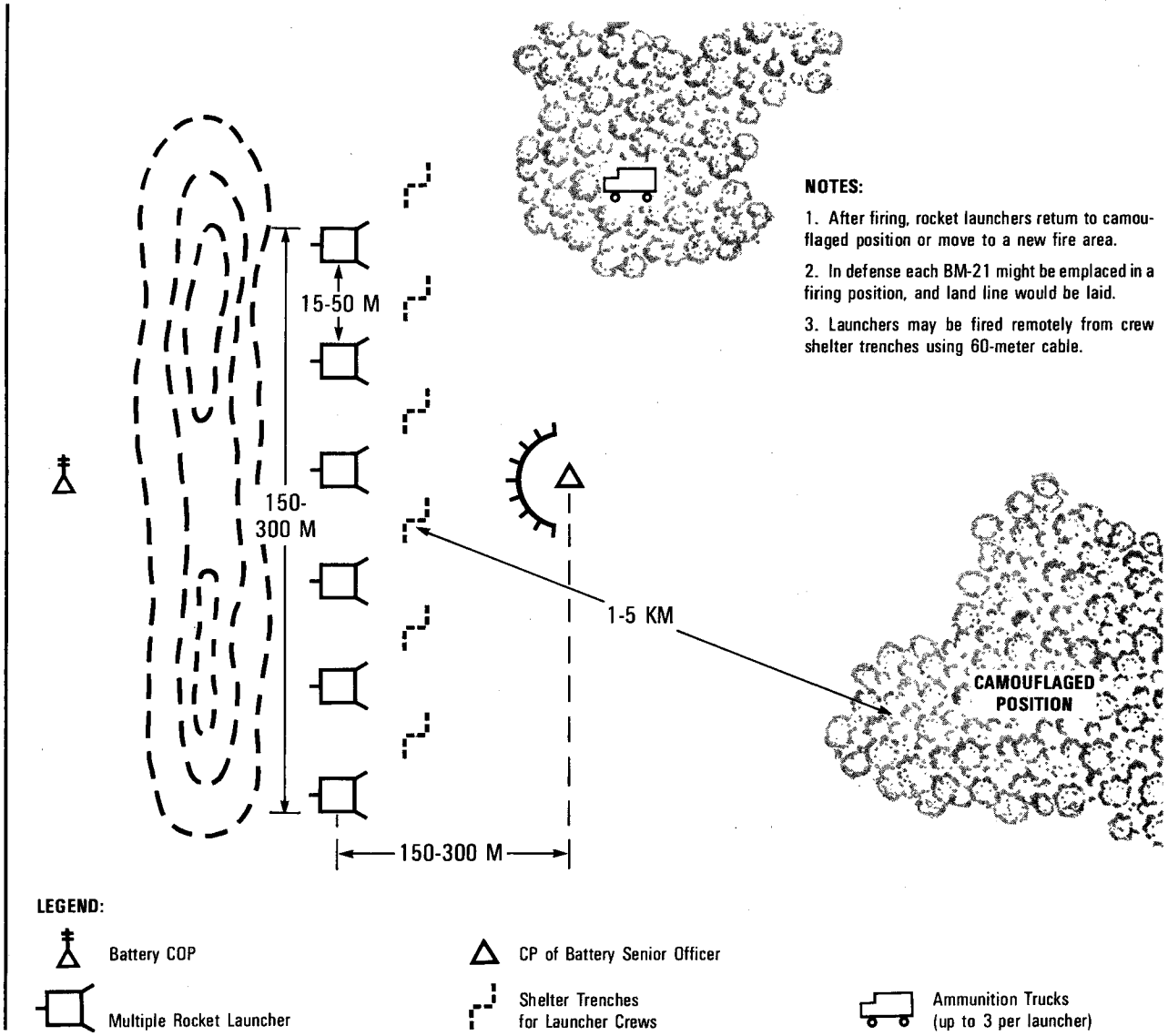
TACTICAL DEPLOYMENT OF MULTIPLE ROCKET LAUNCHERS

Rocket launchers are used to place heavy fire on important targets at decisive moments in an engagement. They also may be used for roving gun missions and counterbombardment. Rocket launcher batteries move forward 1 to 5 kilometers from their camouflaged positions to occupy fire areas, usually loaded and accompanied by one or more ammunition trucks per launcher. To evade counterbattery fire, rocket launchers normally move to either a camouflaged position or to a new fire area immediately after firing. Since they move often, rocket launchers are seldom dug in. Some protection from fire and observation may be gained by siting the battery behind high cover.

During meeting engagements, the battery may deploy in line on one or both sides of a road. The headquarters and ammunition trucks may remain drawn up at the side of the road.

Normally bullhorns are used on the battery fire position. A land line is laid when time permits. The battery COP issues fire control orders by radio or field telephone. Deployment of a BM-21 rocket launcher battery is illustrated below.

Deployment of a BM-21 Rocket Launcher Battery



METHODS OF FIRE

The following Soviet definitions are furnished as necessary background:

Rapid fire is a method of conducting artillery fire whereby the weapon is fired as quickly as possible while not exceeding its maximum rate of fire and not sacrificing accuracy. When the command for rapid fire is given, each individual weapons crew begins to fire independently when ready.

Systematic fire is a method of artillery fire where every round (salvo) is fired on command at a set interval. This method is used for firing on observed targets during registration (individual rounds) or when the unit is firing a destruction mission (salvos). Systematic fire is used against unobserved targets in the course of fire assaults* of a given duration, during controlling fire*, and during harassing fire, usually alternating with rapid fire. The tempo of systematic fire against observed targets depends on the capabilities and equipment of the observer, whereas the tempo of fire against an unobserved target is determined by the amount of time allotted for the expenditure of a given amount of ammunition. The tempo of systematic fire is constant during a fire assault but may be intermittent for harassing fire. Systematic fire may be fired by a single weapon, a firing platoon, or an entire battery. On receiving the mission, the firing unit also receives a rate of fire and an ammunition expenditure requirement.

Counterbattery fire is the use of artillery to accomplish the suppression and/or destruction of enemy artillery batteries located in screened firing positions. (The Soviets no longer officially use this term but state that the concept it represents is still valid and necessary.) Combat with enemy artillery is one of the Soviet Army artillery's most important missions because it enables Soviet ground forces to achieve fire superiority on the battlefield. However, combat with enemy artillery today requires more than counterbattery fire. It now requires the destruction of the enemy command and control centers as well as his artillery and requires the cooperation of the other combat arms and combat aviation.

Maneuver by fire is the shifting of a unit's fire from one target (or group of targets) to another without changing firing positions. This is a combined arms concept in which the artillery plays a critical role. It is used to mass fires on the most important enemy objectives and troop formations to destroy them in a short period of time or to redistribute fires to destroy several targets simultaneously. Maneuver by fire also may be used to shift the main combat effort from one direction to another. In the offense, maneuver by fire is used in the depth of the enemy's defenses to suppress enemy strongpoints, to repulse counterattacks, and to cover by fire the attacking unit's flanks. In the defense, maneuver by fire is used to destroy the enemy as he deploys to attack; repulse the attack; support a counterattack; protect gaps in the defenses, including gaps created by enemy nuclear strikes; seal off enemy penetrations; render assistance to neighboring units; and support a unit that is defending all directions. Wide use of maneuver by fire helps compensate the defending unit for having fewer weapons and enables the defending commander to achieve fire superiority at the critical time in decisive sectors. Plans for maneuver by fire are normally a part of the defensive fire plan. In such planning, artillery units are assigned several supplementary sectors of fire covering areas along the supported unit's flanks and the gaps between units.

In conducting *fire with direct aiming* (often confused with "direct fire"), the gunner of the artillery weapon can aim the piece using direct visual contact with the target. An artillery gunner who can sight directly on the target will usually engage it with direct fire, but because of the target's range or characteristics of the weapon, he may engage it with indirect fire. A mortar crew, for example, could sight directly on a target but would have to engage it with indirect fire. The Soviets write at great length about direct aiming advantages like the reduction in mission time and a drastic reduction in ammunition expenditure. Direct fire is recommended against targets at relatively short ranges (under 1,200 meters). Indirect fire with direct aiming is considered feasible at ranges out to 3 kilometers and perhaps farther, depending on the weapon sighting equipment and visibility.

Offensive Fire

The offensive *fire assault* is characterized by surprise and a high density of fire on the target. Several batteries or battalions fire against an individual target. Fire assaults constitute the major subelements of an artillery preparation for an attack. All (or at least the larger part of) the artillery of a division or army carry out these assaults simultaneously on a large group of targets. Targets may be destroyed or suppressed by fire assaults *(see Target Damage Criteria, Chapter 8)*. The number of fire assaults is determined by the nature of the target to be destroyed (dug-in, covered, armored, etc.), the number of rounds allocated for its suppression/destruction and the time required for available artillery to expend the rounds allocated. The duration of the fire assault is determined by the tactical

*These methods of fire are identified and discussed in subsequent paragraphs.

situation and by the maximum rate of fire of the weapons firing the mission. Soviet experience in World War II indicates that a fire assault would not exceed 15 to 20 minutes. A fire assault of a given duration typically begins with rapid fire (2 to 4 rounds per minute per weapon) and continues with *systematic fire* at a rate that will use the allocated ammunition in the time allotted for the mission. When a target must be destroyed in the shortest possible time, the duration of the assault is not fixed and the mission is conducted at rapid fire until the allocated ammunition is expended. A fire assault also is fired at the rapid rate of fire when a target is to be destroyed rather than suppressed and when a moving target or a target deployed in the open is to be suppressed. In the time intervals between fire assaults, controlling fire (see below) may be used against the target.

Controlling fire is directed at an enemy target in the intervals between fire assaults on the same target. Controlling fire is intended to deny the enemy the freedom to conduct combat activity or to allow escape before the next fire assault. It normally is used when the interval between fire assaults exceeds 15 minutes. Usually it is conducted by a single battery firing at a systematic rate of fire, rapid fire, or a combination of the two, and will expend one tenth to one fifth of the rounds allocated for the engagement.

Safety Distances for Fire Support

The minimum *safety distance* between artillery and aircraft fire and friendly troops varies depending on the weapon caliber, type of projectile, and the range from which the projectiles are being fired.

GUNS AND HOWITZERS:

- Firing without registration over troops in the open at
  - Range less than 10 KM — 500 M
  - Range greater than 10 KM — 700 M
- Firing without registration over troops in armored vehicles or fortifications at
  - Range less than 10 KM — 300 M
  - Range greater than 10 KM — 500 M
- Firing after registration over
  - Troops in the open — 400 M
  - Troops in armored vehicles or fortifications — 200 M

MULTIPLE ROCKET LAUNCHERS: 1000 M

AIR STRIKES: 200-700 M

A *fire concentration* is conducted simultaneously by several batteries or battalions against a common target. The fire concentration is used against enemy troop concentrations, strongpoints, artillery batteries, command and control centers, and other targets. The dimensions of the fire concentration target area depend on the fire mission and the firepower of the artillery subunit firing the mission.

Batteries and battalions conduct fire concentration with all weapons firing at once on the center of the target area. Depending on factors such as target disposition and whether the target is "observed," all weapons may fire on the same elevation and deflection settings or some units may be assigned different settings.

Massed fire is conducted against an important enemy objective by all or most of a given formation's artillery to destroy it in the shortest possible period of time. It consists of one large fire concentration or several large fire concentrations fired simultaneously. Before massed fire is conducted, target areas are designated and each area is assigned a codename. If the dimensions of the target area do not exceed 800 by 800 meters, all participating artillery groups (regiments, battalions) will fire simultaneously on the center of the target area, applying the principles used for fire concentrations. If the target area is larger than 800 by 800 meters, it is subdivided into numbered targets or target sectors. (Areas have codenames; targets and sectors have numbers.) The targets/target sectors are then distributed among the assigned artillery groups or subunits for destruction or suppression with fire concentrations. To the extent possible, the mission will be fired simultaneously.

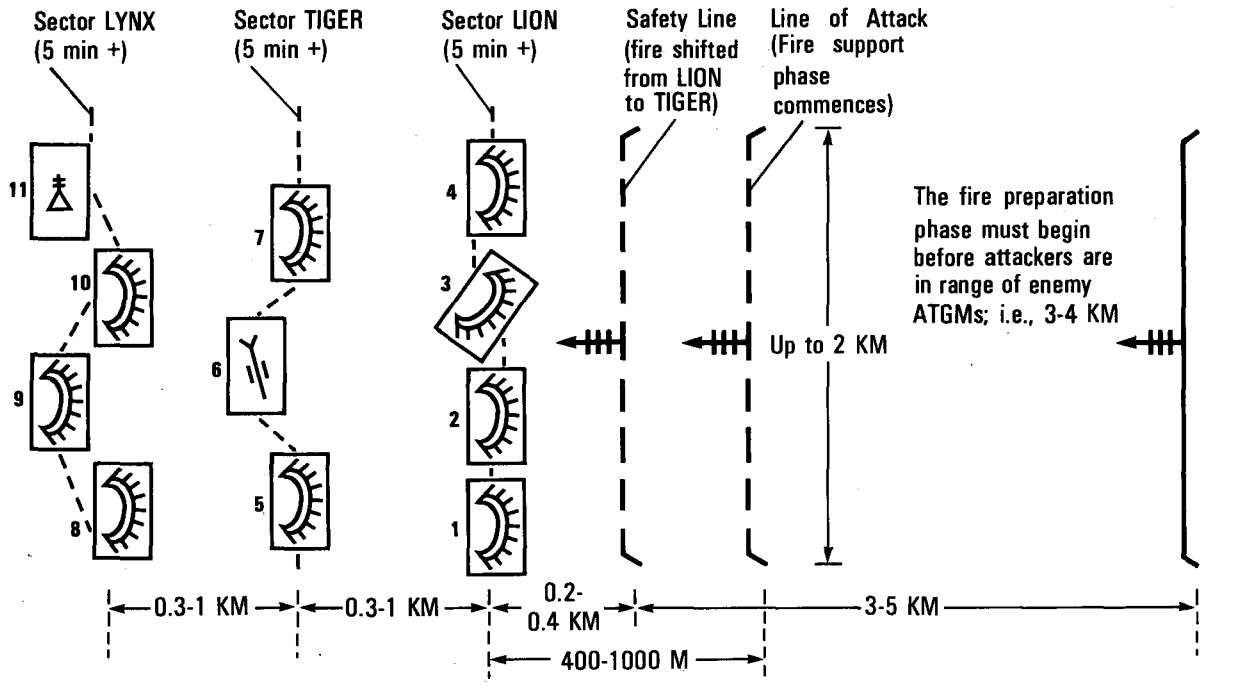
Successive fire concentrations are used in the attack when the supported maneuver unit has begun the final assault on enemy defensive positions. Successive fire concentrations are used when the successive suppression/destruction of specific targets or target groupings (such as strongpoints, weapon systems, and command/control points deployed to the front and on the flanks of attacking troops) is required. Although successive fire concentrations are used primarily to support the offense, it can be used to support counterattacks in the defense. Successive fire concentrations may be single or double. In conducting a single successive fire concentration, the artillery unit fires initially on the single line of targets closest to the attacking troops and shifts the single fire concentration to progressively deeper lines or groups of enemy targets as the supported attacking troops advance. A double successive fire concentration requires the simultaneous fire of two artillery groups.

The first group fires on the line of targets closest to the supported attacking troops, while the second group fires on the next line of targets. The first artillery group then shifts its fires from the first line of concentration to the second line, while the second group shifts its fires from the second line to the third—and so forth. In a double successive fire concentration every line of targets, except the first, is attacked twice.

The first line of concentration covers the defender's forward positions. Subsequent lines of concentration are 300 to 1,000 meters apart through the depth of the enemy's defenses. On each successive fire concentration, concentration sectors are assigned to every battalion or battery firing the mission. The duration of fire on the intial line of concentration (line of targets) is determined by the amount of time required to get the attacking troops from the line of attack (where normally they deploy into attack formation, and preparatory fires become supporting fires) to the artillery fire troop safety line. The duration of fire on subsequent lines of concentration is determined by the distance between the lines of concentration and is initiated on a signal from the combined arms division commander when the ground assault begins. The supported maneuver regiment or battalion commander gives a signal to shift fire to each subsequent line of concentration . The successive fire concentration was used widely with the rolling barrage (see below) during World War II and it is still given prominence today.

The *rolling barrage* normally is used in the support phase of the attack. It is a continuous curtain of fire which is successively shifted from one phase line to another in front of attack troops. Like the successive fire concentration, it may be fired against a single line or against two lines simultaneously, and fire is shifted in a similar way. The rolling barrage differs from the successive fire concentration in that it is planned assuming a uniform distribution of targets throughout the target area. It then shifts fire between phase lines that are uniformly spaced. (The successive fire concentration focuses on targets that require concentrated fires, and the intervals between lines of concentration are determined by target location.) Fire

Successive Fire Concentrations



NOTES:

1. Average target size (200 × 300 meters) would be engaged by up to one artillery battalion.
2. Targets would have already been engaged by preparatory fire.

(NOT TO SCALE)

concentrations may be superimposed on the rolling barrage to insure the destruction of the most important targets.

In the rolling barrage, concentrations are planned on phase lines every 400 to 800 meters, depending on the density of targets in the target area. Intermediate phase lines are planned for every 100 to 200 meters. Artillery units will fire on each phase line for at least 5 minutes at a rate of 4 to 6 rounds per 100 meters per minute and on each intermediate line for 1 or 2 minutes at the same rate.

A rolling barrage is divided into battalion and battery sectors. Standard sector widths are as shown below.

Sector Width for Rolling Barrage

TYPE OF WEAPON	METERS		
	Per Weapon	Per Battery	Per Battalion
Field guns	20-25	150	450
Howitzers	35	200	600-650

The division or regimental commander gives the order to shift from a phase line, but fire is shifted automatically from intermediate lines in accordance with a timed firing program. Phase lines are given the names of animals of prey (lion, tiger, etc.).

The depth of a rolling barrage depends on the nature of the enemy's defenses, the attack plan, and the availability of artillery and ammunition. Normally, the rolling barrage is conducted through the depth of the defenses of the enemy's first echelon battalions. The rolling barrage requires a great deal of ammunition and is not, therefore, the most likely method of offensive fire. It may be used, however, to support a penetration of well-prepared defensive positions and assault river crossings.

Defensive Fire

Barrier fire is a continuous curtain of defensive fire across the approach of attacking tanks and infantry. It is used normally in the defense but also may be employed in offensive operations against enemy counterattacks. Barrier fire is used with fire concentrations, massed fires, and directly aimed fire from tanks and guns. Barrier fire is further divided into standing barrier fire, fired on one line of concentration, and rolling barrier fire on successive lines of concentration.

Standing barrier fire is fire placed on a single line of concentration to disrupt an enemy attack. In the defense, standing barrier fire normally is planned well in advance. It is fired in front of and to the flanks of the defensive positions, and is observed from a ground observation point. All the artillery of a formation except rocket artillery is used to fire the standing barrier fire. Each battalion or battery is assigned a fire concentration sector on the line of fire concentration. The width of each unit's sector is computed based on 50 meters of coverage per gun (howitzer) or mortar. Every standing barrier fire line of concentration is assigned a code name.

The line of concentration for the standing barrier fire must be no closer than 300 to 500 meters from friendly troops for troop safety and so gunners can fire antitank weapons in direct fire at enemy tanks and APCs as they come through the barrier fires. Standing barrier fires begin the moment enemy tanks and infantry approach the planned line of fire concentration and continue at rapid fire until the infantry is cut off from the tanks and halt their attack. If the infantry goes around the fire concentration line, the fires will be shifted to the new approach.

Standing barrier fire is used with other artillery fire and fire from tanks and infantry. For example, if dismounted infantry should lie down to escape the effects of the standing barrier fire, a fire concentration would be fired to destroy them. Tanks penetrating the barriers would be destroyed with direct fire.

Rolling barrier fire is placed on several successive lines of concentration, each closer to Soviet defending troops. Lines of concentration for the rolling barrier fire are planned for terrain that can be observed from a ground observation point. Distances between lines of fire concentration will be 400 to 600 meters and more. The final line of concentration closest to friendly troops will be 300 to 400 meters from forward defensive positions. Every battalion or battery participating in the fire mission will be assigned a sector of fire on each of the lines of fire concentration. The width of each sector is based on the assignment of 25 meters of coverage for each gun (howitzer) or mortar. The entire barrier fire concentration area is given a general codename, and each individual line of concentration is given a number in sequence beginning with the one farthest from the defensive positions. Lines of concentration might be coded "Lion-1," "Lion-2," or "Shark-1," "Shark-2," etc. The rolling barrier fire begins the moment the lead tanks or APCs approach the initial line of fire concentration. The fire continues on that line until the bulk of the advancing force has moved out of the zone where rounds are impacting. Then the fire is shifted to the next line of concentration. Fires continue to be shifted until surviving enemy APCs or

tanks have passed through the last zone of fire concentration.

FIELD ARTILLERY CONDUCT OF FIRE

Massed artillery, "hub-to-hub" weapons, unsophisticated fire direction procedures, and weak logistical support may have been the case during World War II, but are not descriptive of Soviet artillery today.

There are numerous historical examples in which Soviet artillery massed against German forces, particularly in the latter stages of World War II. The Soviets have studied these battles, observed conflicts since that time (especially the 1973 Arab-Israeli conflict), conducted exhaustive weapon effects studies, and incorporated these findings into professional papers.

Soviet *offensive* doctrine calls for intense artillery preparations of *short* duration, if possible, that require a certain number of rounds by type to be delivered to achieve destruction. *Defensive* doctrine calls for *prolonged,* high volumes of artillery fire in depth to break up and to destroy the enemy's attack. To achieve surprise and to limit susceptibility to enemy fires, Soviet artillery tries to be short but violent in the offense and more prolonged in the defense. The fires are massive and are concentrated on critical points in the offense or are dispersed throughout the sector in the defense. This requires not only a numerical superiority in artillery pieces but also rapid fire, long range, and mobility. Above all, the Soviets stress the importance of thoroughly integrated fire and maneuver plans.

While the regimental artillery battalion provides the flexibility and responsiveness required in a fluid combat situation, numerous longer-range tube artillery and multiple rocket launcher battalions from division, army, and *front* provide massive reinforcing fires when required. In this way, the Soviets seek to achieve the densities of fire that they believe necessary without sacrificing the mobility that artillery units need to survive and to perform their mission on the modern battlefield.

In the offensive, an artillery battalion leapfrogs its batteries forward individually in bounds of some 3 to 4 kilometers. By day, it takes a towed howitzer battery about 30 minutes to move, from receipt of the movement order until it is ready to fire the first round in its new position. At night, the same move requires about 40 minutes.

An artillery march column has 25- to 30-meter intervals between vehicles and 100 meters between batteries. A column normally moves at a speed of 15 to 25 kilometers per hour, each subunit being headed by its commander. An artillery battalion occupies some 1.5 to 2.5 kilometers of road space, depending on vehicle spacing.

The ability of field artillery to keep up with maneuver units may be reduced if numerous small attacks require the artillery to deploy. There also are problems in moving artillery pieces across water obstacles. Normally the Soviets use amphibians or ferries for towed artillery, or wait for a bridge to be constructed before the bulk of field artillery crosses. When minefields are encountered, artillery often is delayed until combat engineers have cleared a lane.

These problems have diminished considerably for units equipped with self-propelled howitzers. First of all, the 122-mm SP howitzer is amphibious. Both the 152-mm and 122-mm self-propelled howitzers have excellent mobility on the road and cross-country. The 152-mm SP howitzer requires only one fifth of the time required by an equivalent towed battery to move from one position to another and be ready to fire.

Because of the increased mobility of self-propelled artillery, the Soviets probably move artillery batteries, platoons, and individual guns *within* an assigned firing position *area* to escape enemy counterbattery fire. Within his assigned area, the battery commander selects a primary position and one or more temporary firing positions each 300 to 400 meters away from the previous position. The battery/platoon fires a mission of 3 to 4 minutes duration and then moves to an alternate position. This technique might be used during a long offensive preparation or in the defense when forward or rearward movement is limited. Such frequent and disjointed movement within a firing battery would force fire direction personnel to make numerous time-consuming corrections in elevation and deflection for each firing platoon and possibly for each weapon. Therefore, it is probable that this is practiced only in artillery units with electronic fire direction computers. Average reaction times from receipt of fire orders to first rounds on the ground (on preplanned targets) are as indicated below:

Reaction Times for First Rounds of Fire

Mortar battery	1 to 1.5 minutes
Artillery battalion	2 to 3 minutes
MRL battery	4 minutes
RAG	4 minutes
DAG	5 minutes

The standard reaction time for shifting fire is 2 minutes.

Time Frames for Repositioning of Artillery

WEAPONS	UNIT	TIME IN MINUTES REQUIRED FOR					
		EVACUATION OF FIRE POSITIONS OR ASSEMBLY AREAS		MOVEMENT (PER KM)		OCCUPATION OF FIRE POSITIONS	
		BY DAY	BY NIGHT	BY DAY	BY NIGHT	BY DAY	BY NIGHT
122-mm HOW D-30	BTRY	5-7	9	3 (20 kph)	3.5	10-12	18
	BN	11	14	3	3.5	23	32
152-mm HOW, D-1	BTRY	5-7	9	3	3.5	10-15	15-20
	BN	11	14	3	3.5	23	32
152-mm HOW, D20	BTRY	10	13	3	3.5	12	18
	BN	11	14	3	3.5	23	32
130-mm GUN, M46	BTRY	10	13	3	3.5	12	18
	BN	11	14	3	3.5	23	32
122-mm MRL, BM21	BTRY	3-5	6.5	3	3.5	10-12	18
	BN	7	9	3	3.5	23	32
120-mm MORTAR	BTRY	5.5	8	2.5	3	12	18

NOTE:

Officially, self-propelled artillery (152-mm SP, 122-mm SP) can emplace or displace in 5 minutes; but self-propelled batteries may require as little as one fifth of the time required by equivalent towed artillery to relocate and be ready to fire.

Battery firing procedures of Soviet tube artillery differ significantly from those of the US Army. The most significant difference is probably the location of the battery commander. During the conduct of fire, the Soviet battery commander (a captain or senior lieutentant) is placed in a command observation post several kilometers to the front of the firing battery. From this observation point, he conducts target observation, assists in the computation of fire missions, maintains contact with the ground forces his battery supports, and controls the actions of his firing battery. The Soviets place great emphasis on the experience of the senior officer and his ability to make the most tactically sound decisions about target identification, acquisition, and engagement.

In executing his duties as battery commander/forward observer/computer, he is assisted by several individuals assigned to the reconnaissance section and headquarters platoon. These include the headquarters platoon commander, the commander of the reconnaissance section, an observer, a range finder, a computer, and a radio telephone operator.

Operations in the firing position also have many dissimilarities when comparing Soviet doctrine with that of the US Army. The Soviet's method of fire direction, gun supervision, and gun positioning are all different. The only similarity between a US and Soviet firing battery is probably that each has six guns, although the Soviet battery is broken down into two platoons containing three guns each. The battery FDC

is manned by the battery senior officer (platoon leader of the first firing platoon), assisted by fire direction computation and communications personnel, and has direct radio communications with the battery COP, the battalion COP, and the battalion FDC. The battery senior officer relays firing data to the guns.

The command "to battle" is acted on with the same sense of urgency in the Soviet firing battery as the command "fire mission" in the US firing battery, but the individual steps to bring fire on the target vary significantly. As stated, the battery commander in the COP decides what targets of opportunity will be taken under fire. He also decides how to attack the targets relayed to him by the maneuver forces he is supporting.

In the Soviet system, there are four individuals responsible for the preparation of firing data:

- The battery commander.
- The commander of the headquarters platoon.
- The computer located in the COP.
- The computer located in the firing position.

The computer positioned in the firing position is usually the first to solve the gunnery problem. The senior officer in the firing battery immediately relays the data to the gun platoons. The data is then set on the six guns in preparation to fire.

The battery commander and the computer in the COP also are required to solve the gunnery problem to provide a separate check on the data supplied by the firing battery computer. If, for some reason, the data from the COP is ready before that of the firing position, the battery commander transmits his data directly to the firing position. If a discrepancy exists between the firing data supplied by the two computers, the battery commander decides which is the more accurate. This system demands that the battery commander be as proficient in computing the various gunnery problems as the computers. *The Soviets feel that the independent computation of each gunnery problem by four different computers significantly reduces the chances for a large error.* This technique also insures that a fire direction system is readily available in the event that either the fire direction capability at the COP or the firing position is destroyed or suppressed.

When the battalion controls the conduct of fire, the observation, computation, and firing are conducted similarly to battery level. The battalion commander, normally a major, is located at the battalion COP near the command post of the supported commander. Target acquisition and fire direction computation personnel assist him in acquiring targets, computing fire missions, and adjusting fire. Normally the battalion chief of staff will be in charge of the battalion firing position. He will be assisted by fire direction computer personnel. Depending on the type of mission, battalion dispersion, and time available, battalion fire direction personnel may compute the gunnery problem for the entire battalion or run check computations while each battery computes the data for its own guns. In any case, all computers should begin computation silultaneously because all battalion stations hear the battalion commander transmit the fire mission.

The order to commence fire comes from the battalion commander. The battalion commander can require each battery commander to adjust fire for his own unit by weapon or by battery salvos. Battery and battalion COPs may be supplemented by forward ground or air observation posts. Lone ground observers can be located in trees or in the garrets of buildings. Teams are sometimes located forward in armored vehicles. Air observers may use light observation helicopters to see deeper into the enemy's area. (Air observation is considered essential to the success of counterbattery missions.) Forward and air observers transmit target data to the COP where computation is accomplished.

As electronic computers are introduced into Soviet field artillery battalions, the procedures can be expected to change to accommodate and exploit the new capability. It is unlikely that there will be more than one computer available to each battalion, so fire mission computation and fire control are likely to be centralized at battalion. Battery fire direction personnel will probably receive from battalion fully computed data that is ready to be passed to the guns. They may run check computations manually on a routine or random basis.

Centralizing electronic computation at battalion level is consistent with establishing the battalion (rather than the battery) as the basic firing unit in Soviet artillery. It may be some time before these changes in organization, doctrine, and equipment are seen in all the field artillery units of the Soviet Army. However, the forward areas will probably be equipped first.

FIRE PLANNING

The fire planning process includes target acquisition, organization for combat, assignment of tactical missions, determination of ammunition requirements, and formulation of a detailed fire plan. The fire plan is coordinated and approved at the highest level of participating units and includes input from subordinate units.

Planners are guided by the following principles and targeting priorities when developing offensive fire plans:

Principles of Fire Planning

PLANNING GUIDANCE

- Nuclear fires, chemical strikes, conventional fires, and tactical air support are included in a single, coordinated plan.
- Fire preparations precede major offensive actions, whether or not nuclear weapons are to be used.
- All artillery may be deployed for firing with direct aiming at regimental and lower levels.
- Fires of tanks and antitank artillery may be used during preparations.

TARGET PRIORITIES FOR OFFENSIVE FIRES

- Nuclear-capable artillery and missiles and their control systems.
- Command posts, observation posts, communications, and radar stations.
- Enemy defensive strongpoints, especially ATGM positions.
- Conventional artillery and air defense units.
- Reserves and service support units.

The fires of all artillery units within a division are incorporated into the army or *front* fire plan. The artillery unit commander at each level coordinates the fires under his control. He determines new requirements and missions and, with the chief of rocket troops and artillery or chief of artillery (depending on the level), makes suggestions to the combined arms commander concerning adjustments in tactical organization as the situation develops.

The division CRTA submits requests and recommendations for the employment of nuclear fires. The fires of nuclear weapons organic to the division and/or nuclear strikes allocated to the division from army level are integrated with air strikes, conventional fires, and the overall scheme of maneuver.

Prearranged signals are used for requesting and shifting nonnuclear fire to successive lines and objectives. The CRTA indicates exactly where to establish artillery observation posts, trying to place them together with the observation posts of the maneuver commanders.

The basis for division artillery fire planning is established by the division commander, his CRTA, and other staff members during the reconnaissance of the area of anticipated action. During such reconnaissance, the organization for combat and means of coordination may be refined. The artillery representative receives information from the maneuver commander that forms the basis for determining the following:

- Targets to be fired on by artillery.
- Priority of each target.
- Sequence in which targets will be attacked.
- Time for attack of each target.

An overriding factor in fire planning is the availability of nuclear fires. Doctrine emphasizes the planning of nuclear fire with conventional fire support in all types of military operations.

Extracts from an example fire plan for a 122-mm howitzer battalion supporting the attack of a motorized rifle battalion are given at the right. The attack is made from positions in contact. This extract has two major parts: *preparatory* fires and fires in *support* of the attack. Fires in support of the attack consist of preplanned, successive fire concentrations delivered on three lines to a depth of 2.5 kilometers. The first line, WOLF, includes the platoon strongpoints on the forward edge of the defense, designated as sector 11. When the assaulting forces reach a safety line about 200 meters from line WOLF, fires are lifted on call to the deeper line, RAT.

Besides successive fire concentrations, other on-call fires are preplanned; these consist of fire concentrations, fire at individual targets, and barrier fires. Barrier fires are planned where enemy counterattacks are expected. They may coincide with the lines of successive fire concentrations.

The firing during the preparation phase is based on a time schedule shown in the fire plan and supplemented with radio, telephone, and visual signals. In addition, signals are prescribed to call for fire, to cease fire, and to shift fire.

Signals for Fire

ACTION	VISUAL	RADIO/ TELEPHONE
Call for Fire	Green Flares	Hurricane
Cease Fire	Red Flares	Stop
Shift Fire	Three-Star Flare	Storm

Illustrative Fire Plan, 122-mm Howitzer Battalion

PREPARATORY FIRES

TIME	METHOD OF FIRE AND TARGETS	SIGNALS	1ST BATTERY	2ND BATTERY	3RD BATTERY
H-40 to H-27 (13 Min)	FIRE ASSAULT: Artillery and mortar batteries, CPs, radar, platoon strongpoint of companies in first echelon of defense.	• Green flares • SNOWSTORM 2121 (Radio/telephones)	TGT 60 90 rds Sector 11 120 rds	TGT 18 140 rds Sector 11 90 rds	TGT 40 80 rds Sector 11 120 rds
H-27 to H-17 (10 Min)	FIRE ASSAULT: Platoon strongpoints within deeper defensive positions; destruction of targets by direct fire; controlling fires against artillery and mortar batteries.	• Star flares • HAIL 3131 (Radio/telephones)	Sector 16 120 rds TGT 69 14 rds	Sector 16 165 rds	Sector 16 165 rds
H-17 to H-5 (12 Min)	FIRE ASSAULT: Platoon strongpoints within companies of first echelon of defense.	• Yellow flares • RAIN 4141 (Radio/telephones)	Sector 11 120 rds	Sector 11 150 rds	Sector 11 150 rds
H-7 to H-1	OVERLAPPING FIRE: 1st Battery fires at artillery and mortar batteries. (Overlaps H-Hour transition from preparatory to supporting fires.)	• Yellow flares • RAIN 4141 (Radio/telephones)	Target 60 60 rds	**TOTAL ROUNDS PREPARATORY 1584**	

SUPPORTING FIRES

TIME	METHOD OF FIRE AND TARGETS	SIGNALS	1ST BATTERY	2ND BATTERY	3RD BATTERY
H-Hr to H-5	SUCCESSIVE FIRE CONCENTRATIONS On Line 1 WOLF (Sector 11)	• Line 1 WOLF • Green flares • HURRICANE 5555 (Radio/telephones)	Overlapping Fires, as above	45 rds	45 rds
ON CALL	5 minute fires on Line 2 RAT (Sector 21)	• Line 2 RAT • Star flares • THUNDER 6666 (Radio/telephones)	50 rds	50 rds	50 rds
ON CALL	5 minute fires on Line 3 TIGER (Sector 16)	• Line 3 TIGER • Yellow flares • TYPHOON 7777 (Radio/telephones)	32 rds	32 rds	32 rds
ON CALL	FIRE CONCENTRATIONS Individual targets BARRAGE FIRES	Readiness to open fire on Targets 20, 25, 32, 33, 69, 71 Targets A and B			

TOTAL ROUNDS, PLANNED SUPPORTING 1152

NOTE: These fire concentrations and barrage fires are contingency plans and will be used depending on the progress of the attack.

Fire planning for an attack is a deliberate and precise process. Weapons and ammunition, target characteristics, and the plan of the maneuver commander are considered in terms of the target damage criteria. *(See Target Damage Criteria, Chapter 8).* If ammunition is limited, the maneuver commander may have to accept a lower level of damage.

In the example fire plan, 1.9 units of fire are expended to attack the prepared enemy defense. Thus, the total expenditure of rounds is expected to be 18 guns x 1.9 units of fire x 80 rounds per unit of fire, or 2,736 rounds.

Of the total, 1.1 units of fire are planned for preparatory fires (1,584 rounds) and 0.8 units of fire (1,152 rounds) for the rest of the day.

If time is available, it is normal to lay out on the ground the ammunition planned for use during the preparation. The ammunition loaded on battery and battalion (possibly regimental) transport is kept for later use.

FIELD ARTILLERY IN THE OFFENSE

There are four phases of artillery support for an attack against a defending enemy: fire support for a force's movement forward, preparation, support of the attack, and accompaniment.

Fire support for a force's movement forward is used to cover a unit's movement to contact with the enemy. It may be used to cover a first echelon's movement from an assembly area to an attack position, or to cover a follow-on force's movement forward before actual commitment to battle.

Artillery *preparation* for an attack is the phase of artillery fire that precedes the tank and infantry assault against the enemy. The artillery preparation is to suppress and/or destroy a defending enemy with organized, thoroughly planned, massed fires so as to deny him the opportunity to organize resistance. During the preparation phase, artillery fires are directed against enemy troops, weapon systems, command and control centers, supporting communication systems, and defensive structures.

The duration and organization of the artillery preparation is determined by the overall attack plan, the nature of the enemy's defenses, the level of destruction required, the number and type of fire preparation missions allocated to rocket troops and aviation, and whether and in what quantity nuclear or chemical weapons are employed. The length of the preparation depends on the time required to achieve the planned level of destruction. In an attack from the march, the preparation lasts until first echelon maneuver units are ready to deploy into attack formation. The fire preparation might consist of several artillery strikes, the first and last of which normally would be the most powerful. The final strike concentrates on the enemy's artillery and mortar batteries, and overlaps the end of the fire preparation phase and the start of the fire support phase. Suppression of enemy defenses may take place simultaneously throughout the entire tactical and immediate operational depth of the enemy's defenses. (Tactical and immediate operational depth are determined by the enemy's division and corps rear boundaries, respectively).

The fire preparation phase might last up to 50 minutes. Because of the mobility of potential targets and the threat of enemy counterbattery fire, the Soviets are striving to increase the intensity and to reduce the length of the preparation phase—possibly to less than 15 minutes. They are adding more artillery to the force structure, and are giving special emphasis to the addition of multiple rocket launcher units.

Artillery *support of the attack* starts when the supported maneuver units begin their assault and continues with their advance through the enemy's defensive positions. The artillery fires on the enemy immediately in front of and on the flanks of attacking Soviet troops, shifting fires in sequential bands progressively deeper into the enemy's defensive positions (normally successive fire concentrations or rolling barrage). Artillery support tries to keep the fire superiority attained during the artillery preparation phase and suppresses enemy defenses during the attack.

Artillery support fires must coincide with the advance of the supported maneuver unit. The length of time artillery fires on the initial barrage line or line of targets is determined by the time required for the supported attacking troops to move from the line of attack to a safety line. Fires are shifted from line to line on the command of the maneuver unit commander.

In the artillery *accompaniment* phase, artillery units support maneuver units as they exploit their success in the rear of the enemy's defenses. The accompaniment phase begins at the end of the support phase and continues until the attacking forces have accomplished their mission—this normally would refer to the division mission of the day. During the accompaniment phase, artillery units displace with the units they support and fire on newly located targets or targets that have survived the preparation and support phases. Priority of fires go to the enemy's tactical nuclear weapons, artillery and mortars, and antitank weapons. Artillery operations in this phase coincide with the operations of the supported units and aviation support elements. During the accompaniment phase, artillery

units provide fires to the maneuver units as they attack enemy defenses from the march, fight meeting engagements, force water obstacles, commit the second echelon or reserve to battle, or repulse an airborne assault. If the enemy counterattacks, the artillery, in conjunction with tanks and motorized rifle troops, fires on the counterattack force as it advances and deploys for the attack. During pursuit, accompanying artillery fires on the withdrawing enemy and destroys or suppresses enemy units left behind to cover the withdrawal.

In the accompaniment phase, artillery units fire various types of missions, depending on the tactical situation. If the attackers encounter an enemy strongpoint in the depth of the enemy's defenses, the supporting artillery attacks the target with a fire concentration or massed fires. For repulsing a counterattack, the artillery employs defensive fire tactics such as standing barrier fire or rolling barrier fire. In supporting a unit that must overcome an enemy occupying hasty defensive positions, force a water obstacle, or commit its second echelon, the artillery might have to conduct a short preparation (4 to 10 minutes) followed by supporting fires (successive fire concentrations). The antitank reserve normally is used to repulse enemy counterattacks, to provide security for the flanks of supported units, or to reinforce hasty defensive positions assumed by the attackers in the course of the attack.

In this phase, the supporting artillery must conduct wide-ranging maneuvers in depth and across its front, using both fire and movement, and be prepared to reorganize and reorient its fires (maneuver by fire) to reinforce maneuver units moving on the main direction of attack. (The main direction of attack might change during the course of the attack).

The fire and maneuver of artillery units during all phases are planned in the initial fire plan. The artillery accompaniment part of the plan is then refined continuously during the course of the attack. The artillery accompaniment is conducted in close cooperation with aviation elements and other forces and systems (e.g., tactical rockets) executing the fire accompaniment phase.

The Soviets plan to achieve certain *density norms* for artillery, depending on the tactical situation. In the penetration of well-prepared enemy defenses, for example, high numbers of tubes per kilometer of frontage are desirable, even under nuclear-threatened conditions. However, modern artillery and methods of fire control will allow lower densities than those which were considered standard during World War II.

Some average guidelines for desired densities are—

- Attack of a well-prepared defense, in the direction of a main attack: 60 to 100 tubes per kilometer of frontage.
- Attack on a hasty defense in the direction of a main attack: 60 to 80 tubes per kilometer of frontage.
- Attack on a supporting axis: 40 tubes per kilometer of frontage.

These densities include all calibers of guns, howitzers, and mortars. Densities computed in number of tubes may increase by 50 to 75 percent when multiple rocket launchers are included.

Based on the fire plan, artillery is deployed to provide preparatory fires and the initial fire support of the attack. The figure below provides tactical deployment guidelines for Soviet artillery.

The prime mission of artillery in the *meeting engagement* is to gain and keep fire superiority over the enemy.

Tactical Deployment Norms

DISTANCES	MORTARS	GUNS & HOWITZERS	MULTIPLE ROCKET LAUNCHERS
Between Weapons	16-60 M	20-40 M	15-50 M
Between Batteries	—	500-1500 M (normally about 1000 M)	1000-2000 M
From the FEBA	500-1000 M	3-6 KM (DAG) 1-4 KM (RAG)	3-6 KM

In the meeting engagement, artillery is used—

- To neutralize enemy fire support means, especially nuclear-capable means.
- To impede maneuver and deployment of enemy forces.
- To cover the deployment and support the attack of friendly forces.

In anticipation of a meeting engagement, code designation for fire requests on particular areas and terrain features are planned in detail; a chart of selected reference points is distributed. Although basic fire planning is carried out by the CRTA, artillery often receives orders and amendments to orders by radio while on the move. Detailed fire planning is conducted by units initially engaging the enemy. As the battle develops, and as additional artillery is deployed, the fire plan is refined and enlarged to provide maximum fire at critical points. Accompanying artillery is positioned to facilitate prompt fires for each maneuver unit as it is committed. Reinforcing artillery displaces at a greater distance to be in the best location to support the battles with maneuver by fire.

In a *pursuit,* long-range artillery, moving forward by bounds, delivers interdiction fire on crossroads and communication routes to slow the enemy's retreat and to disrupt the approach of his reserves. The more mobile artillery units available to the tactical commanders (self-propelled weapons, multiple rocket launchers, and mortars) normally are attached to parallel pursuit units. Control of forward artillery is decentralized to a great degree to meet the requirements of a fluid situation. Nuclear strikes may be employed on the retreating enemy force. Tactical air support is increasingly important during the pursuit, when the artillery does not have sufficient time to emplace.

FIELD ARTILLERY IN THE DEFENSE

Fires in the defense consist of fire strikes, by all available delivery means, planned against the likely approaches to the defense positions. Close coordination is stressed between nuclear, chemical, and conventional artillery and aircraft delivery means. Intelligence efforts concentrate on determining enemy formations and locating their nuclear delivery means.

As in the offense, "maneuver by fire" in the defense means the shifting of concentrated fires. An essential part of maneuver by fire is the ability to shift fires as the enemy maneuvers. It is used to bring a high volume of fire against the enemy's most important attack groupings, against targets in his rear, and for covering friendly flanks with fire.

The artillery organization for combat in the defense is similar to that in the offense. Artillery groups are located so that they can execute their primary mission and still be capable of massing fires in support of forward defense positions, particularly against armor.

Fire planning supports the defensive mission of the force. The defensive plan provides for—

- Destruction or neutralization of enemy nuclear and nonnuclear weapons. Counterpreparation and counterbattery fires are planned for this purpose.
- Neutralization of enemy command and control facilities.
- Neutralization of enemy march columns and troop concentrations.
- Interference with the deployment of the attacking enemy.
- Support of friendly units, to include forces in the security zone.
- Neutralization of the enemy in front of the forward defenses.
- Neutralization of enemy units that have penetrated the defenses through extensive use of on-call fires and direct fire artillery.
- Delivery of fire in support of counterattacks and counteroffensives.
- Covering by fire the gaps and flanks in friendly sectors, engineer obstacles, and natural obstructions.
- Contamination of terrain and obstacles.
- Firing of smoke rounds.
- Illumination.

Artillery weapons are deployed in concealed and dispersed positions to employ flanking, interlocking, and suppressive fires at very close ranges and with great intensity. Each battery prepares primary, alternate, and night-firing positions. Selected artillery units will occupy temporary firing positions, located well forward, to provide fire support to units in the security zone.

Roving batteries and guns are employed to confuse the enemy as to the deployment and fire plans for friendly artillery. The regimental chief of artillery plans in detail the deployment of a roving unit. The plans include positions, missions, method of fire and number of rounds to be fired from each position, itinerary and duration of the mission. The roving unit may leave camouflaged decoys in a position to create the impression that it is still occupied.

FIRING NORMS

Firing norms are established for ammunition expenditure, the area coverage expected, the effect of the target, and the density of fire over time. When

establishing these norms, Soviet artillery planners consider several variables which are listed in the tables they publish for use in the field.

The norms change as any one or more of the variables change. These variables include—

- Type of target (e.g., equipment or personnel, deliberate or hasty defensive positions, hard- or soft-skinned vehicles, point or area disposition, etc.).
- Type and caliber of weapon engaging the target.
- Range to the target.
- Whether the target is under direct observation during the artillery attack.

A general table of ammunition expenditure norms to which most subsequent tables refer is given below. Time is not considered. These norms might apply to any of the methods of fire described. Note that the targets are
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Ammunition Expenditure Norms

NORMS GOVERNING AMMUNITION EXPENDITURE FOR THE DESTRUCTION OR SUPPRESSION OF STATIONAR
TARGETS AT RANGES OF 10 KM OR LESS. (DELIBERATE OCCUPATION OF FIREING POSITION - SURVEY LAY

NUMBER	TARGET	REQUIRED EFFECT	RIFLED BARREL CALIBER IN MILLIMETERS							CALIB
			76	85	100	122	130	152	203	82
1	(Missile) launcher	Target destruction	800	720	540	300	280	200	70	-
2	Battery (platoon) of armored self propelled artillery (mortars)	Target suppression	1000	900	720	450	360	270	120	-
3	Battery (platoon) of unarmored self-propelled or dug-in towed artillery (mortars)	Target suppression	540	480	360	240	220	180	100	400
4	Battery (platoon) of towed artillery in the open	Target suppression	250	220	150	90	80	60	30	180
5	SAM battery	Target suppression	250	240	200	150	150	100	60	-
6	Signal and radar vans or radar control point in the open	Target suppression	420	360	280	180	180	120	60	350
7	Dug-in troops and weapons in prepared defense strongpoint positions	Suppression of 1 hectare of target area	480	450	320	200	200	150	60	-
8	Dug-in troops and weapons, tanks, infantry fighting vehicles, and APCs in hastily prepared defensive positions, and assembly areas	Suppression of 1 hectare of target area	400	350	250	150	150	110	45	300
9	Troops and weapons in assembly area in the open	Suppression of 1 hectare of target area	50	45	30	20	20	15	5	35
10	Command post in dug-out shelter or other overhead cover	Suppression of 1 hectare of target area	480	450	320	200	200	150	60	-
11	Command post in the open (or mounted in vehicle)	Suppression of 1 hectare of target area	120	100	80	50	50	40	15	-
12	ATGM, anti tank gun or other individual target in the open	Target suppression	250	240	180	140	140	100	50	240

artillery planners
listed in the tables

or more of the
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nt or personnel,
ons, hard- or soft-
osition, etc.).

- Type and caliber of weapon engaging the target.
- Range to the target.
- Whether the target is under direct observation during the artillery attack.

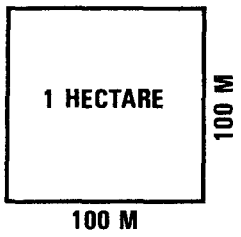
A general table of ammunition expenditure norms to which most subsequent tables refer is given below. Time is not considered. These norms might apply to any of the methods of fire described. Note that the targets are unobserved and situated at a range of 10 kilometers or less from the artillery. The table is based on the assumption that the rounds are fired by batteries that have made deliberate (as opposed to emergency) occupation of their firing positions. This means that the batteries are laid based on survey data and that they are firing with meteorological data that is no more than 3 hours old.

IS GOVERNING AMMUNITION EXPENDITURE FOR THE DESTRUCTION OR SUPPRESSION OF STATIONARY UNOBSERVED
ETS AT RANGES OF 10 KM OR LESS. (DELIBERATE OCCUPATION OF FIREING POSITION - SURVEY LAY, RECENT MET)

	REQUIRED EFFECT	RIFLED BARREL							MORTARS				ROCKET ARTILLERY		
		CALIBER IN MILLIMETERS							CALIBER IN MILLIMETERS				MEDIUM CALIBER	MED CAL LONG-RANGE	LARGE CALIBER
		76	85	100	122	130	152	203	82	120	160	240			
	Target destruction	800	720	540	300	280	200	70	-	-	140	60	510	360	200
	Target suppression	1000	900	720	450	360	270	120	-	450	220	120	560	400	240
-propelled or	Target suppression	540	480	360	240	220	180	100	400	240	160	100	400	320	180
	Target suppression	250	220	150	90	80	60	30	180	90	40	20	150	120	60
	Target suppression	250	240	200	150	150	100	60	-	-	-	-	-	200	100
	Target suppression	420	360	280	180	180	120	60	350	180	80	40	300	240	120
ɔared	Suppression of 1 hectare of target area	480	450	320	200	200	150	60	-	200	100	50	320	240	100
infantry tily pre- embly areas	Suppression of 1 hectare of target area	400	350	250	150	150	110	45	300	140	85	45	240	180	80
	Suppression of 1 hectare of target area	50	45	30	20	20	15	5	35	10	8	4	10	8	5
	Suppression of 1 hectare of target area	480	450	320	200	200	150	60	-	200	100	50	320	240	100
	Suppression of 1 hectare of target area	120	100	80	50	50	40	15	-	25	20	10	30	20	15
	Target suppression	250	240	180	140	140	100	50	240	140	80	35	-	-	-

Calculation of Fire Coverage

FIRE COVERAGE IS CALCULATED IN NUMBER OF ROUNDS PER HECTARE. A HECTARE IS 10,000 SQUARE METERS, THE EQUIVALENT OF 2.47 ACRES.



= 10,000 M² = 2.47 acres

DESTRUCTION

POINT TARGET - 90 percent probability that target is no longer combat effective.

AREA TARGET - High probability (at least 90 percent) that at least 50 percent of the elements comprising the target are no longer combat effective and/or that at least 50 percent of the target area has been destroyed (rendered ineffective for combat).

SUPPRESSION

AREA TARGET - High probability (at least 90 percent) that 25-30 percent of the elements comprising the target grouping are no longer combat effective and/or that 25-30 percent of the target area has been destroyed.

At ranges of *10 kilometers or less,* coverage is determined using the table on page 9-23. To compute the ammunition expenditure on unobserved targets located at distances greater than 10 kilometers, the Soviets use the following formula:

$$N_d = \frac{D}{10} N_{10}$$

WHERE:

N_d = The number of rounds of ammunition expended per hectare of target area at a given distance beyond 10 kilometers.

D = The actual distance to be fired, rounded off to the nearest kilometer.

N_{10} = The number of rounds to be fired per hectare of target area per norms established for the same weapon system at a distance of 10 kilometers or less.

Based on expenditure norms, the Soviets establish minimum target dimensions for firing batteries. The minimum target size (example at right) varies with range to target and weapon dispersion factors.

Minimum Target Size

SUPPRESSION BY:	RANGE	RANGE
	Up to 6 KM	Over 6 KM
Battery of 122-mm Howitzers	100 M x 150 M (1.5 hectares)	100 M x 200 M (2 hectares)

A target smaller than the minimum is attacked with the same amount of ammunition required for the minimum size target.

Each weapon is assumed to be able to suppress an area, given in hectares, the size of which depends on the time allotted and the type of target. Examples A and B, Target Area Suppressions (shown at right) illustrate the area coverage of an unobserved platoon strongpoint given different mission times. The firing unit is a 122-mm howitzer battalion.

In Example A, the range is 10 kilometers; in Example B, 15 kilometers. The Soviets will not always fire 100 percent of the suppression norm depending on the importance of the target or because of limitations on time and/or ammunition. A unit might also fire less than 100 percent because the target is being engaged by more than one artillery unit.

EXAMPLE A —

THE AMOUNT OF TARGET AREA IN HECTARES THAT CAN BE SUPPRESSED BY A 122-mm HOWITZER BATTALION FIRING AT A RANGE OF **10** KM OR LESS.

TARGET: Hastily prepared strongpoint position (see target number 8, Ammunition Expenditures Norms, page 9-23).

AMOUNT: 100% of norm = 150 rounds per hectare of target.

TIME ALLOWED FOR ARTILLERY STRIKE IN MINUTES	TARGET AREA (HECTARES)					
	50%		75%		100%	
	BATTALION	BATTERY	BATTALION	BATTERY	BATTALION	BATTERY
5	6.0	2.0	4.0	—	3.0	—
10	9.6	3.2	6.4	2.1	4.8	—
15	13.2	4.4	8.8	2.9	6.6	2.2
20	16.2	5.4	10.8	3.6	8.1	2.7

EXAMPLE B —

THE AMOUNT OF TARGET AREA IN HECTARES THAT CAN BE SUPPRESSED BY A 122-mm HOWITZER BATTALION FIRING AT A RANGE OF **15** KM.

TARGET: Hastily prepared strongpoint position, (see target number 8, Ammunition Expenditure Norms, page 9-23).

AMOUNT: 100% of norm = 225 rounds per hectare of target.

(Product of formula $N_d = \frac{D}{10} N_{10}$ applied to expenditure norm of 150, or $1.5 \times 150 = 225$.

TIME ALLOWED FOR ARTILLERY STRIKE IN MINUTES	TARGET AREA (HECTARES)					
	50%		75%		100%	
	BATTALION	BATTERY	BATTALION	BATTERY	BATTALION	BATTERY
5	4.0	—	—	—	—	—
10	6.4	—	4.3	—	3.2	—
15	8.8	2.9	5.9	—	4.4	—
20	10.8	3.6	7.3	2.4	5.4	—

NOTE: A dash in place of a number indicates that the number of hectares covered was less than 2 for a battery and less than 3 for a battalion.

To achieve the optimum coverage in a battalion concentration, the following guidelines apply:

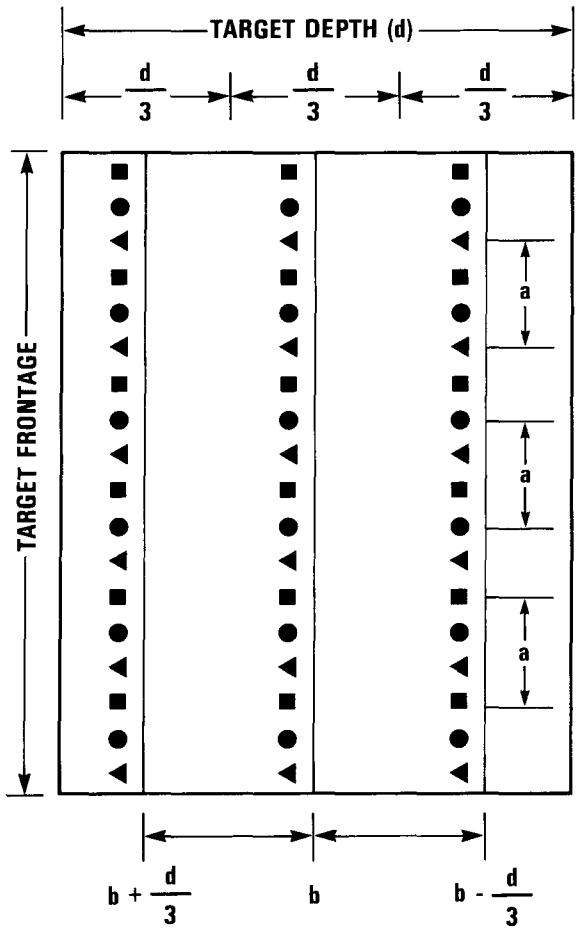
- Target Unobserved (Corrections not Possible).

Range setting: If the target is 100 meters deep or less, all tubes will fire on a single elevation setting. If the target is deeper than 100 meters, all tubes will be fired on three different elevation settings with the interval between settings equal to one third of the depth of the target. (See illustration below.)

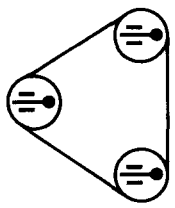
Deflection settings: Each battery will fire on a single deflection setting that insures coverage of the entire frontage of the battalion's target. As a result, each of the three batteries in the battalion superimposes its fire on that of the other two.

- Target Observed (Fire Adjusted). When the target is observed and fire can be adjusted on the target, the battalion target area normally will be subdivided into three roughly equal target groupings. Two batteries will be assigned target groups side by side across the target's frontage, and the third battery will attack targets in the depth of the target area. (See illustration at right.)

Distribution of Rounds on an Unobserved Area Target



FIRING UNIT - TUBE ARTILLERY BATTALION



LEGEND:

- ■ 1st Battery Burst
- ● 2d Battery Burst
- ◀ 3d Battery Burst
- **a** Interval between deflection settings of the six guns in any one battery
- **b** Basic Range Setting
- **d** Depth of Target (greater than 100 meters)

Range settings: Each battery will fire on a single elevation setting if the depth of the target is 100 meters or less. If the depth of the target exceeds 100 meters, each battery will fire on three different range settings so that the interval between lines of concentration is equal to one-third of the depth of the target.

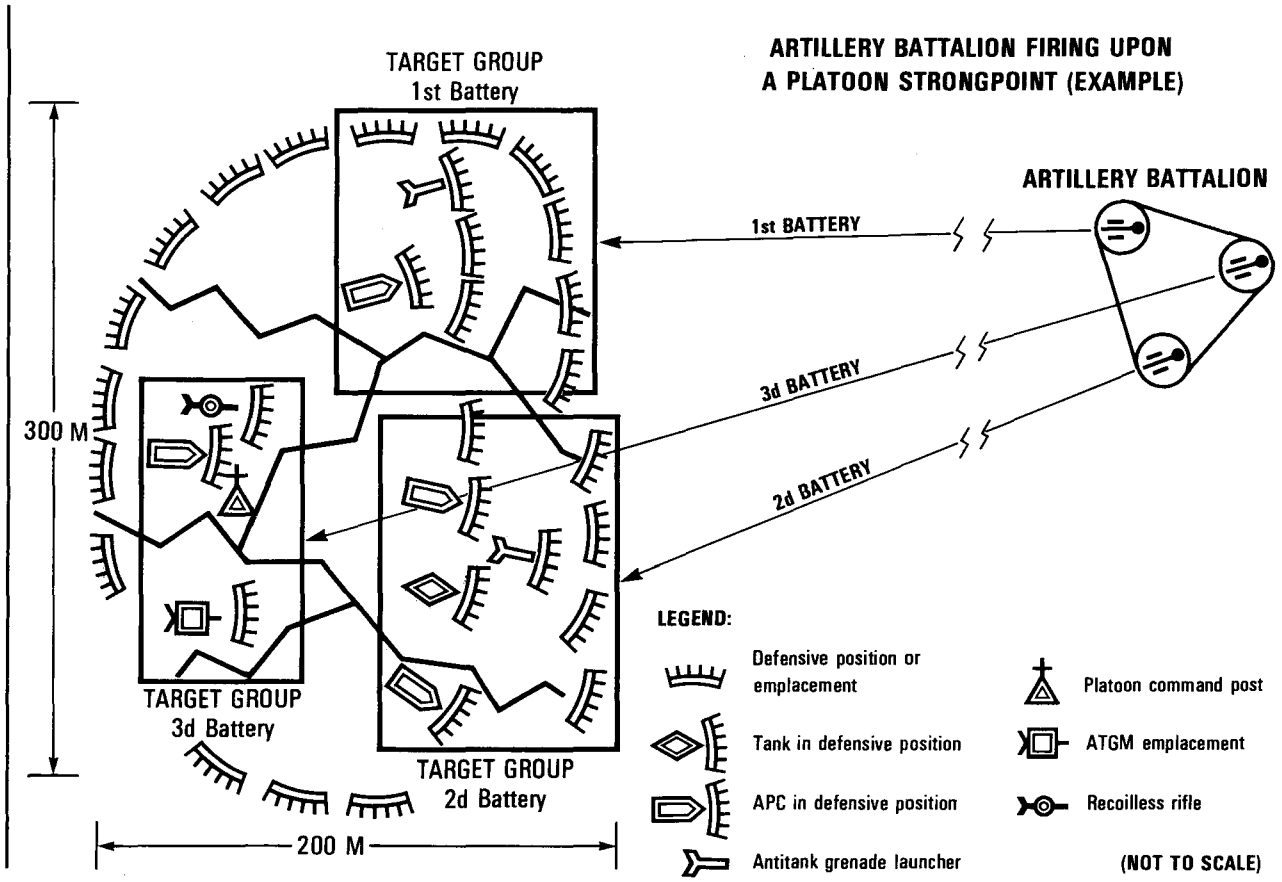
Deflection settings: If the target coverage per weapon is 25 meters or less, each battery will fire all tubes on a single deflection setting. If the target coverage (sheaf) per weapon is 25 meters to 50 meters, then the battery will fire on two different deflection settings. Mortar batteries will always fire on a single deflection setting. Target coverage per piece is obtained by dividing the target frontage by the number of weapons in the firing battery.

Until recently, the time required for mission accomplishment was not a major consideration in Soviet artillery planning except as a factor in coordination with supported maneuver units. Minimum time requirements may still not be officially incorporated into Soviet artillery manuals as "norms," although such a change is now being called for by the Soviet Chief of Rocket Troops and Artillery.

The Soviets now are striving to reduce drastically the time required for fire missions. Among the reasons given, the most important are—

- *Target mobility.* Targets on today's battlefield are normally armored, highly mobile, and can relocate within minutes from the time they come under fire.
- *Increased effectiveness of fire.* The same ammunition allocation is much more effective against a target when the entire allocation is fired within a short period of time. This is especially true for the initial fire assault of a long fire preparation and for short, intense fire preparations.
- *Increased survivability.* The Soviets assess that enemy target acquisition capabilities have improved considerably, allowing enemy artillery to acquire and fire on Soviet artillery batteries within 4 minutes from the time the first Soviet round is fired.

Battery Target Grouping Assignments for an Observed Target



9-27

As a result of this perception of the threat, Soviet artillery planners try to reduce mission times to 4 minutes. This goal is especially important for the accompaniment phase. However, in a large-scale attack, the preparation and support phases often will be longer. When the enemy is defending and the Soviets have overwhelming fire superiority, they perceive their own vulnerability to enemy counterbattery fire to be greatly reduced.

When the rounds strike a target over a shorter period of time, the result is an increase in the density of fire on the target. In Soviet artillery computations, density of fire is measured by the number of rounds striking a hectare of the target area in one minute. Apparently, the Soviets have not yet formally established minimum density "norms", but their publications strongly suggest that 25 to 30 rounds per hectare per minute is the minimum acceptable density against most types of targets. Densities might even be higher for a moving target.

The Soviets consider highly dense artillery fire to be extremely effective in—

- Suppressing or destroying enemy defenses—especially ATGM positions.
- Suppressing or destroying moving armored targets—since the effect is so intense and sudden that the target is unable to escape or take cover.

The Soviets are developing technical, operational, and organizational solutions to the problems of reducing mission times and increasing fire density, such as those identified below.

The Soviets are introducing qualitative and quantitative changes in field artillery equipment and organizations, and revising their deployment doctrine. The density of artillery fire support assets in combined arms formations has been greatly increased. The introduction of improved munitions, self-propelled weapons, electronic fire direction computers, and improved target acquisition assets has enhanced the mobility and reaction time of artillery fire support.

Although the Soviets apparently continue to compute combat power ratios on the density of artillery weapons, the current emphasis is on density of fire rather than weapons. The artillery battalion has been designated as the basic tactical and fire unit. Missions that previously were fired by a single battery now are assigned to two or three battalions. Artillery units practice conducting fire missions without first firing registration and by adjusting fires with ground surveillance, counterbattery radars, and sound-ranging equipment. Batteries are assigned two or three alternate firing positions within a battalion firing position and are expected to reposition after one or two fire missions.

The Soviets consider that these measures will insure their artillery fire superiority by simultaneously contributing to the battlefield survivability of Soviet artillery and the destruction of the enemy's artillery. Achieving the desired mobility and firing norms will depend, in part, on the wider fielding of automated systems for intelligence analysis and firing data computation.

Solutions for Increasing Fire Effectiveness

TECHNICAL

- Increasing the rate of fire of newer generations of artillery weapons.
- Using improved rangefinders to reduce adjustment time on the target and to eliminate the need for registration for many types of missions.
- Using electronic computers to reduce mission computation time.

OPERATIONAL

- Firing accurately from emergency occupied positions.
- Firing for effect without registration.
- Using entire battalions to fire missions that previously were fired by individual batteries.

ORGANIZATIONAL

- Using more artillery to accomplish the same mission. This is the reason for designating the battalion as the basic firing unit.
- Providing organic artillery to all maneuver regiments. Tank regiments, formerly without organic artillery, now have up to a battalion of 122-mm howitzers.

CHAPTER 10

ANTITANK SUPPORT

ANTITANK WEAPONS SYSTEMS

The Soviets divide antitank weapons into two categories: general and special.

General weapon systems include missiles, aircraft, tanks, and artillery. These systems are designed to destroy a wide variety of battlefield targets, but may be employed successfully against tanks and other armored vehicles. According to the Soviets, any artillery-type weapon (over 20 mm) should have an antiarmor capability. All conventional artillery up to 152-mm caliber has good direct fire antitank capability and carries some armor-defeating ammunition. The 122-mm towed and SP howitzers and the 152-mm SP howitzer with their 360 degree traverse are particularly effective in this role. Field artillery often is used for direct fire. Antiaircraft guns could engage ground targets if required.

Special antitank weapon systems consist of antitank guided missiles (ATGMs), antitank guns, grenade launchers, and recoilless guns. These weapons are designed specifically to destroy tanks and their crews by direct fire. The Soviets consider ATGMs to be very effective antitank weapons, but limited by minimum ranges, low rate of fire, and visibility requirements. Soviet antitank forces therefore have been structured with a mix of ATGMs and direct fire weapons (guns and grenade launchers). The direct fire weapons provide quick-response fires at medium, short, and point-blank ranges, on broken ground, and under favorable visibility conditions.

The Soviets state that in a nonnuclear environment, direct fire from antitank guns, ATGMs, and tanks is the principal and most reliable means of destroying tanks. However, if nuclear weapons are employed, they will constitute the principal antitank fire support means. The capabilities of nuclear weapons, combined with the variety of delivery systems, allow for the destruction of whole tank units at practically all depths of the battlefield.

The Soviets believe that the high density of armored vehicles and improved techniques for their employment on the battlefield demand particularly careful and complete integration of general and special antitank weapon systems available at every level into the antitank fire support plan. The plan is developed in detail and coordinated at the highest level. Special emphasis is placed on careful terrain analysis to identify high-speed armor approaches and on the organization of surveillance and early warning systems. Flanks and likely armor approaches are covered by mutually supporting antitank weapons sited in depth. During tactical moves, antitank elements are placed throughout march columns.

ORGANIZATION AND EQUIPMENT

Since neither *front* nor army has a fixed organizational structure, the antitank units at these levels will also vary. Normally, the *front* would have at least one antitank regiment assigned to its artillery division. *Front* and army antitank assets can be allocated to first echelon divisions, be assigned to the army combined arms reserve, or form the nucleus of an army antitank reserve.

The motorized rifle division antitank battalion normally consists of an ATGM battery and two gun batteries. A gun battery has two platoons and a fire control section. Whenever possible, the battalion is reinforced by engineer units who assist in construction of antitank obstacles. There are no antitank guns in Soviet tank regiments or at Soviet tank division level. The only ATGMs are in the tank division's motorized rifle regiment. All motorized rifle regiments have an ATGM battery.

An ATGM battery consists of three platoons. Each platoon has three BRDM-2s mounting six AT-3/SAGGER or five AT-5/SPANDREL ATGMs. In addition, platoon and battery commanders have BRDM-2 scout cars which mount 14.5-mm machine guns and carry target illumination equipment for night combat. The 14.5-mm machine guns on the command BRDMs are for engaging enemy infantry and soft-skinned vehicles.

Each BRDM-2 SAGGER launch vehicle carries six missiles ready for launching and eight in reserve. Each SPANDREL launch vehicle carries five ready-to-fire missiles and an estimated ten reserve missiles. Additional missiles are carried by three trucks.

The antitank platoon of a BTR-equipped motorized rifle battalion consists of three squads. One is equipped with two 73-mm recoilless guns SPG-9. The other two each have two manpack ATGM consoles (AT-3 or AT-4). Each squad is transported in a BTR.

TACTICAL EMPLOYMENT

Antitank units can be employed as a special antitank reserve, as an element of a combined arms reserve, or they may be integrated into a combined arms

formation itself (usually in the defense). The most frequent type of tactical employment is as a special antitank reserve.

Regimental, divisional, and sometimes army antitank reserves are formed both in attack and defense. They may consist of guns and guided missiles and generally will include an engineer mobile obstacle detachment (MOD) to lay hasty minefields. Tanks also may be included if the role of the antitank reserve is to deploy rapidly to meet tank threats. When additional assets (flamethrowers, tanks, combat engineers) are attached to the antitank reserve, these elements normally are subordinate to the antitank artillery commander.

Command relations of antitank units under conditions of attachment or support are comparable to those of field artillery units. (See section on Command and Control, Chapter 9).

If the antitank unit is designated as an antitank reserve, the unit commander is assigned missions directly by the combined arms commander. If the antitank artillery unit is part of a combined arms reserve, the unit commander is assigned missions by the commander of the combined arms reserve.

Antitank units may deploy in line, in two lines, echeloned right or left, or they may form a horseshoe or circle. These formations may be adopted by platoons within a battery or by the batteries of a battalion. Siting of the weapons within a platoon or battery is guided by the principles of defense in depth and mutually supporting fires.

The most common formation for the antitank battalion is two lines of batteries. Two batteries are placed in the first echelon and one in the second. They are sited to provide mutual support. Battery fire positions are located up to 1,000 meters apart. Alternate fire positions for the battery in the second line normally are chosen on the flanks.

The echelon right (or left) battle formation is chosen when it is necessary to cover tank approaches from both the front and one of the flanks. The subunits are again sited for mutual support.

Weapons sited at the top of a horseshoe formation open fire at extreme ranges, inviting enemy tank attacks so that the other guns can open flank fire. If enemy tanks penetrate the kill zone of a horseshoe, fire will be delivered simultaneously by all weapons.

Antitank guns usually are sited about 100 meters apart, but occasionally may be up to 300 meters; batteries and platoons are usually 300 to 500 meters apart, but may be up to 1,000 meters. Subunits normally are sited with overlapping fields of fire. Antitank battalion and battery commanders control fire from command observation posts, normally collocated with one of the fire positions. The battery reconnaissance section deploys as a forward observation post to give warning of approaching enemy tanks. Antitank minefields may be laid by a mobile obstacle detachment 1.5 to 2 kilometers in front of antitank fire positions on the main tank approaches.

An ATGM battery can deploy with distances of 30 to 300 meters between vehicles and up to 1,500 meters between platoons; however, normal frontages are 500 meters per platoon and 1,500 meters per battery. Battery and platoon commanders control the fire of the launchers from observation points that usually are sited slightly to the rear and preferably on high ground. In good tank country, platoons are likely to be in line, but in broken country, one or more subunits will be in depth and platoons may be deployed independently. Within platoons, vehicles may be one-up, two-up, or echeloned to a flank. Whenever possible, ATGMs will be sited on high ground, clear of close or wooded country.

Normally each launcher is given an 80 degree arc of fire overlapping with each of its neighbors. Missiles are nearly always launched when the BRDM is stationary, preferably behind cover, or in defense, from a prepared emplacement. A normal drill is to fire not more than two missiles, then move at least 200 meters to a new firing position. Missiles also may be fired and controlled remotely from a position up to 80 meters away. Standard time for setting up in this mode is about 1.5 minutes.

THE OFFENSE

During an attack, the antitank reserve usually moves behind advancing first echelon tanks and infantry in the most exposed direction of attack, ready to repulse enemy armored counterattacks. The combined arms commander or the CRTA chooses successive firing lines to cover likely tank approaches. Firing positions are selected by the antitank unit commander.

The antitank reserve advances to successive firing lines in coordination with the progress of the attacking force and the orders of the combined arms commander to whom it is attached.

In preparation for an attack, antitank units are located on the most likely enemy armor approaches or may be positioned well forward to participate in the artillery preparation phase of the attack. They may be called upon to conduct fire with direct aiming against the enemy's armored vehicles. Antitank guns can conduct indirect observed fire (particularly when there is insufficient artillery).

During the artillery preparation phase, antitank units are responsible for—

- Containing enemy armor.
- Covering the deployment of the attacking units.
- Engaging armored and antitank targets on the forward edge of the enemy position as part of the preparatory fires.

During the support phase of the attack, antitank subunits cover the flanks and support the deployment of the second echelon and reserve.

During the accompaniment phase, fire positions are selected in the depth of the enemy positions from which to defeat armored counterattacks. Having received orders to deploy to one of these positions, the antitank unit commander will lead his weapons forward, put out observation posts, and move himself to a position from which he can direct fire. He will establish close cooperation with the maneuver force commander and the mobile obstacle detachment.

In anticipation of a meeting engagement, antitank subunits march with the advance guard or at the head of the main force. They must be prepared to deploy immediately and to provide fire support. At the beginning of a meeting engagement, antitank units will deploy in the threatened sector on an assigned firing line, covering the deployment of the combined arms force.

THE DEFENSE

The antitank fire support plan is developed in greater detail in the defense than in the offense. The Soviets believe that the basic system of fire in the defense is antitank fire. The antitank fire plan is designed to place an enemy armored force under continuous fire from the point of its first detection until it is destroyed in a first echelon kill zone.

ATGMs are given an engagement zone that extends out to 3 km from the forward edge. Tanks firing from defilade positions first engage attacking tanks at 2 to 2.5 km in front of the defensive positions. The engagement zone for antitank guns extends out to about 1.5 km. SPG or RPG weapons engage enemy armor at ranges less than 1000 meters.

In the defense, antitank units have these missions:

- Destroy enemy tanks and APCs forward of the first echelon.
- Destroy tanks and APCs that have penetrated the first defensive echelon.
- Cover gaps in the defense.
- Support the counterattack.

Fixed-wing aviation, surface-to-surface missiles, and massed artillery fires may be employed against detected armor concentrations in assembly areas. Aircraft, especially ATGM-equipped attack helicopters, are the most effective weapon for engaging moving armor forces at greater ranges. Minelaying helicopters also may be used to lay hasty antitank minefields.

Indirect artillery and MRL fires are effective in isolating tanks from supporting forces and causing tank crews to secure the hatches. Although indirect artillery and MRL fires increase the vulnerability of attacking tanks to special antitank weapons (by stripping them of their supporting forces), the smoke and dust of the explosions can simultaneously degrade the effectiveness of direct fire support weapons by impairing gunner visibility.

At the start of a defensive action, the antitank reserve normally occupies camouflaged positions from which it can cover the most likely tank approaches. The Soviets state that each tank, ATGM, or antitank gun firing from a prepared camouflaged defensive position can defeat two to three attacking tanks. The commander selects from one to three firing lines to which his weapons may deploy on each possible approach. Subunit reconnaissance and engineer preparation of routes and fire positions follow, if time allows.

An antitank unit may be integrated into the defensive first echelon, occupying designated positions in either a battalion defensive area or company strongpoint. This type of deployment is usually by platoon, with the separation between platoons insuring mutually supporting fires. Battle formation depends on the mission and terrain and must insure the following:

- Concentration of fire on tanks by direct sighting along armor avenues of approach.
- Covering by fire of approaches to antitank barriers.
- Close coordination between the weapons of the antitank subunits and the antitank weapons of the company strongpoint or the battalion defense area.
- All-round defense of each platoon.

As the antitank reserve for a defending combined arms formation, an antitank subunit's tactical deployment is based on mission and terrain and must insure the following:

- Coordinated and concentrated fires on armor approaches.
- Echelonment of the firing positions in depth.
- Conduct of flanking fire on enemy tanks.
- Maneuver of the unit within the area of deployment and to firing lines.

If the defending units are forced to withdraw, ATGMs and antitank guns cover the withdrawal of forward elements. Antitank units break contact and withdraw to a new firing position when enemy armor has closed to 500 meters.

CHAPTER 11

AIR DEFENSE

CONCEPTS AND PRINCIPLES

The objective of the Soviet tactical air defense system is to reduce the effectiveness of enemy air attacks. This can be achieved by forcing enemy aircraft to expend their ordnance while still beyond the effective or optimum ranges of their weapons or by destroying the aircraft when they come within effective range of Soviet air defense weapons.

There are two important concepts in Soviet tactical air defense. First, air defense is considered to be an integral element of the combined arms concept. Secondly, air defense of ground forces is achieved by a variety of weapons and equipment that together form a system of air defense.

Soviet air defense of maneuver units includes three phases. The first phase includes all actions taken to destroy enemy aircraft while they are still on the ground at airfields or in marshaling areas. Soviet aviation resources and surface-to-surface missiles play the major role in this phase. The second phase includes all actions taken to destroy enemy aircraft while in flight but still at some distance from Soviet ground forces. Soviet aviation plays a sizable role in these actions, and medium-range air defense missile units also may have some role. The third phase entails the destruction of enemy airplanes and helicopters that have penetrated into the air space of Soviet maneuver elements. This role primarily belongs to Soviet tactical air defense forces. These three phases may overlap, and all three may be conducted simultaneously. This chapter discusses only the third phase.

The mission of the Soviet tactical air defense forces is to protect ground force units and other potential targets from attacks by fixed-wing ground attack aircraft and armed helicopters. To accomplish this mission, it is not necessary for Soviet air defense units to destroy every attacking enemy aircraft. If the Soviet tactical air defense system can prevent enemy air crews from pressing their attacks or can force them to expend their ordnance prematurely, for the most part it will have accomplished its mission. Soviet ground forces then are able to continue their missions.

The basic principles that have influenced Soviet air defense developments and apparently form Soviet tactical air defense doctrine are:

- *Firepower.* The Soviets use a variety of air defense weapons, both missiles and guns, and a force structure that provides a significant number of these weapons, with a suitable mix of capabilities to ground force commanders.
- *Surprise.* Soviet writers emphasize the principle of surprise. They are aware of not only the physical destruction that can be achieved by an attack on an unsuspecting enemy, but also of the psychological effects of violent and unexpected fires on aviation crews. The psychological effects often are only temporary, but they can reduce the effectiveness of attacking air crews at critical moments.
- *Mobility and maneuver of air defense weapons.* The Soviets' mobile tactical air defense system allows air defense units to maneuver with tank and motorized rifle forces.
- *Continuous activity by air defense units.* Comprehensive air defense coverage can be guaranteed only if air defense units are constantly active and provided with adequate logistic support.
- *Aggressive action, initiative, and originality on the part of air defense unit commanders.* The Soviets recognize that air defense unit commanders must exploit the full capabilities of their equipment if they are to carry out their missions successfully. This demands aggressive action, initiative, and originality on their part. The future battlefield will be a fluid and volatile environment. Air defense unit commanders must be responsive to changes in the tactical situation. For example, if the supported unit's mission is modified, the air defense unit commander must reevaluate his own unit's deployment in light of the new requirements. The air defense unit commander also must be aware of changes in the tactics employed by enemy air forces.
- *Coordination of actions between supported maneuver units and supporting air defense units and between air defense units.* This principle emphasizes the Soviet perception of air defense as a single system composed of its various parts rather than a series of separate, distinct actions that bear no relation to each other or the conduct of the ground battle. Air defense is an integral element of the ground battle.
- *All-round security.* The Soviets recognize that air attack can come from any quarter and that it is not enough to provide security for only the units close to the forward edge and only in the direction of enemy forces.

ORGANIZATION AND EQUIPMENT

The Soviet inventory of tactical air defense weapons includes a variety of missiles, guns, and support equipment. There are air defense weapons at nearly every level. As with other weapon systems, the Soviets have incorporated recent technological developments into newly designed air defense weapons while improving other weapons already in production. They have developed a variety of air defense missiles while continuing to develop antiaircraft artillery (AAA).

A BMP-equipped motorized rifle battalion has an air defense platoon containing nine SA-7 surface-to-air missile (SAM) launchers. A BTR-equipped motorized rifle company has an air defense squad containing three SA-7 launchers. While tank companies are not known to have SA-7s, most Soviet tanks are equipped with turret-mounted antiaircraft machine guns. All Soviet tactical units receive training in the employment of massed, small arms weapon fire. This technique is practiced routinely to engage low-flying enemy aircraft, usually under the supervision of the company commander when he has been notified that enemy aircraft are approaching his position.

The SA-7s of the BTR-equipped motorized rifle company usually are employed as a squad, with the company commander retaining tight control. SA-7 gunners are not routinely attached to the platoons of the company. In a prepared defense, the battalion commander or regimental chief of air defense may control the employment of the company's SA-7s.

No air defense unit is organic to BTR-equipped motorized rifle battalions or tank battalions, although there may be an SA-7 squad assigned to protect the battalion command post or other points designated by the battalion commander. SA-7 SAM squads can be employed in any tactical unit, and also at higher levels. Armored vehicles of the battalion command group are equipped with vehicle-mounted antiaircraft machine guns.

The Soviet practice of positioning the command post in the key sector of the battalion's area in the defense provides an element of protection. The primary means of air defense for the maneuver battalion, however, is provided by its companies and the air defense elements attached from regimental or divisional assets. Usually such attachment is practiced by the Soviets and is the rule when the battalion is engaged in independent or semi-independent actions.

The systemic nature of Soviet tactical air defense measures can be seen in the maneuver regiment. There is a chief of air defense in the regiment. His responsibilities include planning and directing air defense activities within the regiment. He advises the commander on allocation and deployment of the regiment's air defense assets, and he may sometimes control the employment of SA-7 SAMs of the subordinate motorized rifle battalions or companies.

Soviet tank and motorized rifle regiments have an organic air defense battery equipped with the ZSU-23-4 self-propelled antiaircraft gun (SPAAG) and the SA-9 SAM. The battery consists of a headquarters, a platoon of four ZSU-23-4s, a platoon of four SA-9 SAM launchers, and support and service elements. The regimental headquarters has a squad of three SA-7 SAM gunners.

The ZSU-23-4 has a relatively small engagement envelope and is considered a limited area or point defense weapon. Normally it is employed with individual SPAAGs located within several hundred meters of one another. When the four guns of a ZSU-23-4 platoon are employed in pairs, the pairs are usually kept within approximately 1,500 meters of one another. Typical missions for these weapons may involve two to four ZSU-23-4s protecting a battalion in the regiment's first echelon or on a road march.

The SA-9 has an engagement envelope significantly larger than that of the ZSU-23-4 and is an area defense weapon. It provides the regimental commander with an organic air defense missile capability that can encompass his entire unit. The SA-9 normally is deployed between the first and second echelons of a regiment, a location from which it can protect both first and second echelon subunits without being exposed to direct fire from enemy ground forces. Probable missions of SA-9 units include protecting the regimental command post, the regiment's organic artillery battalion, and other organic or attached elements in the regiment's sector.

A number of the new SA-13 SAM systems have been deployed in the Group of Soviet Forces in Germany since 1980. SA-13 units are replacing SA-9 units. Unlike the SA-9, the SA-13 is a tracked vehicle with greater cross-country mobility.

Introduction of the SA-6 or the SA-8 SAM into the divisional air defense regiment significantly improved air defense mobility and firepower. The transporter-erector-launchers (TEL) of both missiles are highly mobile. The SA-6 is mounted on a nonamphibious tracked vehicle, and the SA-8 is mounted on an amphibious wheeled vehicle.

Employment of the SA-6 or the SA-8 has a major impact on the division's combat capability. The division now has an organic air defense system that provides a significant degree of protection to the entire division. The range of the SA-6 provides for greater depth in the division's air defense system, especially against aircraft employing standoff weapons.

While the range of the SA-8 is significantly less than that of the SA-6, its higher road speed and amphibious capabilities make it especially well suited for pursuit or exploitation.

A Soviet army usually has one or two SAM brigades equipped with the SA-4 SAM. Generally, the missions of army-level air defense units are to augment divisional air defense capabilities in the forward area and to engage and destroy aircraft that get past the divisions' air defense systems.

The Soviets have developed extensive and effective radar target detection and fire control systems. Their radars can be assigned to two general categories: surveillance and fire control. Surveillance includes early warning, target acquisition, and height finding radars. Some fire control radars also have limited target acquisition capability.

It is important to view Soviet radars as systems rather than as separate units. Because the majority of target acquisition radars are concentrated above division level, most target information is accumulated and processed at army and *front* air defense operations centers and passed down to divisions. High level commanders select the weapon system that can best engage a given target. Target detection and monitoring by *front,* army, and division target acquisition radars provide the necessary data for engagement without unnecessarily exposing the air defense firing battery and TEL-mounted (particularly SA-8) radars to detection by enemy forces and subsequent neutralization by electronic countermeasures or destruction. (For more information on air defense organization and equipment, see FM 100-2-3.)

MISSIONS

Front headquarters plays a major role in the control of air defense assets of its subordinate units. The *front's* own air defense weapons are used for various missions, depending on the situation. Some may augment the air defense weapons of armies of the *front.* Others may provide general, *front*-wide air defense coverage or fill gaps between armies. In any event, *front* air defense assets are used primarily to insure continuous coverage in both detection and engagement capabilities. *Front* air defense weapons usually are located somewhere to the rear of army air defense weapons to engage aircraft that penetrate forward air defenses.

SA-4 units of Soviet armies provide medium- to high-altitude air defense and augment the air defense assets of divisions. Their engagement envelope extends from the army's rear to about 45 kilometers beyond the forward edge of the battle area (FEBA) for first echelon armies. Laterally, this SA-4 coverage overlaps the envelope of adjacent armies.

The mission of the division's air defense regiment is to protect the maneuver regiments and other units or facilities within the division's area of activity. First echelon maneuver regiments, division headquarters, and the division's artillery and rocket units have the highest priorities for protection. The division commander is assisted by a chief of air defense, a field grade officer, who with his staff plans and directs the division's air defense operations.

Air defense regiments equipped with the SA-6 or the SA-8 SAM are capable of including all elements of the division in their engagement envelopes. Typical employment of the regiment's five missile firing batteries might involve two batteries providing support directly to the two first echelon maneuver regiments, while the remaining three batteries provide protection for the division headquarters, rocket and artillery units, and the remainder of the division. Units to the rear of first echelon maneuver regiments are protected by the engagement envelopes of the first echelon regiments and the missile batteries directly supporting them. The ranges of the SA-6 and the SA-8 allow them to be deployed several kilometers behind the line of contact, thus reducing their exposure to enemy ground-based weapons. From these positions, the missile batteries can still engage targets well forward of the FEBA.

SA-7 SAMs employed in the rear area provide local air defense against enemy aircraft that penetrate the division's primary air defense network. Control of the SA-7s is probably highly centralized to prevent engagement of friendly aircraft by mistake.

Front through division air defense assets are employed to create an area defense. Radars provide an unbroken detection envelope extending well into enemy territory and across the entire zone of operations. Enemy aircraft that manage to get past Soviet fighters probably are engaged first by *front* and army SA-4 missile units. While gaps may appear in the missile engagement envelope, significant effort is devoted to maintaining continuous coverage.

If enemy aircraft penetrate the air defense systems of *front,* army, and divisional air defense regiments, they will be engaged by the short-range SA-7 and SA-9 SAMs and the ZSU-23-4 antiaircraft guns of the maneuver regiments. Tank, motorized rifle, and artillery units in the division's first and second echelons and the air defense subunits themselves are expected to be the primary targets of enemy air attacks. The ZSU-23-4 platoon of the maneuver regiment, directly supplemented by the regiment's SA-9 SAMs and further

supplemented by divisional air defense batteries, provides the key regimental air defense.

SUPPORT IN THE OFFENSE

Soviet ground force air defense weapons can fully support fast-moving tank and motorized rifle forces in dynamic offensive combat. Air defense units of *front* and army conduct basically an area defense, engaging enemy aircraft at some distance from the supported maneuver divisions and themselves. Divisional air defense regiments conduct primarily an area defense, though there is a significant element of point defense in support of the division's maneuver regiments. Operations by air defense batteries and the SA-7 SAM sections are largely of the point type due to the capabilities of their weapons and the units they defend.

Air defense actions are most complex in the maneuver regiment. As the supported unit performs its assigned missions, it continuously changes its location and combat formation. The air defense unit commander must respond to these changes and redeploy his own weapons to provide continuous and effective protection to the regiment's elements.

Allocation of air defense units is weighted in favor of maneuver units in areas where the threat is perceived to be the greatest. For example, a motorized rifle regiment in the division's first echelon usually receives additional air defense support from one or more batteries of the division's air defense regiment. These batteries need not operate in the maneuver regiment's formation. The range of their radars and missiles allows them to provide support to the first echelon from locations farther to the rear. Locating these missile batteries to the rear also decreases the likelihood of their being destroyed by enemy ground fire or aircraft.

A motorized rifle battalion attacking in a regiment's first echelon often is supported by ZSU-23-4s of the regiment's antiaircraft artillery platoon. In his combat order, the regimental commander assigns the ZSU platoon the mission of supporting particular battalions for a specified period. This period can begin before a battalion moves into an assembly area, in which case the air defense element provides protection to the battalion during the road march to the assembly area. Alternatively, the ZSU-23-4 platoon may join the maneuver battalion in the assembly area, though the Soviets prefer to have both subunits arrive at the assembly area at approximately the same time. Failure of the air defense subunit to join the maneuver battalion at the designated time leaves the battalion exposed to possible enemy air attack. In either case, the ZSU-23-4 platoon leader reports to the maneuver battalion commander, and direct communications are established. The ZSU-23-4 platoon maintains communications with the regimental air defense battery. It also receives information from the divisional air defense target identification and warning network. This communications system provides for timely receipt of information on the tactical air situation.

The maneuver battalion commander and the ZSU-23-4 section or platoon leader work closely to integrate their weapons into an effective air defense plan. As the battalion occupies the assembly areas, air defense weapons deploy in accordance with this fire plan. Light discipline is strictly enforced, and radio listening silence is employed to reduce the likelihood of detection by enemy signal intelligence units. If the assembly area is to be occupied for an extended period, such as overnight, the ZSU-23-4s and the weapons and vehicles of the battalion are usually dug in.

The battalion commander provides guidance for the placement of the ZSU-23-4s and the SA-7 SAMs. Observation posts and firing positions are selected to provide comprehensive observation and interlocking fires on the most likely approach routes for low-flying aircraft and armed helicopters. When the entire platoon is employed, the two pairs of ZSU-23-4s are kept within mutually supporting range. As a rule, one gun crew is on alert in each of the ZSU-23-4 pairs except when warning of an air attack is received, at which time both crews go to alert status.

The SA-7 SAM squads of the three motorized rifle companies supplement the coverage provided by the ZSU-23-4 section or platoon. The three gunners of one company's SA-7 squad may be placed near the ZSU-23-4 section or platoon. The ZSU subunit leader may be given some degree of control over these SA-7 gunners in such a situation. The SA-7 squad of another motorized rifle company could cover a less likely avenue of approach. Placement of these SA-7 gunners is similar to that in an air defense ambush. The three SA-7s of the third motorized rifle company may be retained with the battalion in the assembly area to provide close-in protection. Observation posts are collocated frequently with SA-7 firing positions.

Besides the ZSU-23-4s and SA-7 SAMs, the battalion employs its vehicle-mounted machine guns, ATGMs, and massed small arms for close-in defense. When the battalion is reinforced by a tank company, the antiaircraft machine guns on tanks provide additional air defense firepower in the assembly area.

To attack the battalion in its assembly area with conventional ordnance, an enemy aircraft must first penetrate the engagement envelopes formed by missile units of *front,* army, and divisions. The

attacking aircraft then come within range of the regimental and battalion defense systems. The ZSU-23-4s engage enemy aircraft immediately as they come within range. SA-7 gunners engage enemy aircraft that maneuver to avoid ZSU-23-4 fires or pass over the SA-7 firing positions. Finally, small arms and vehicle-mounted weapons engage enemy aircraft that pass over the maneuver battalions' positions.

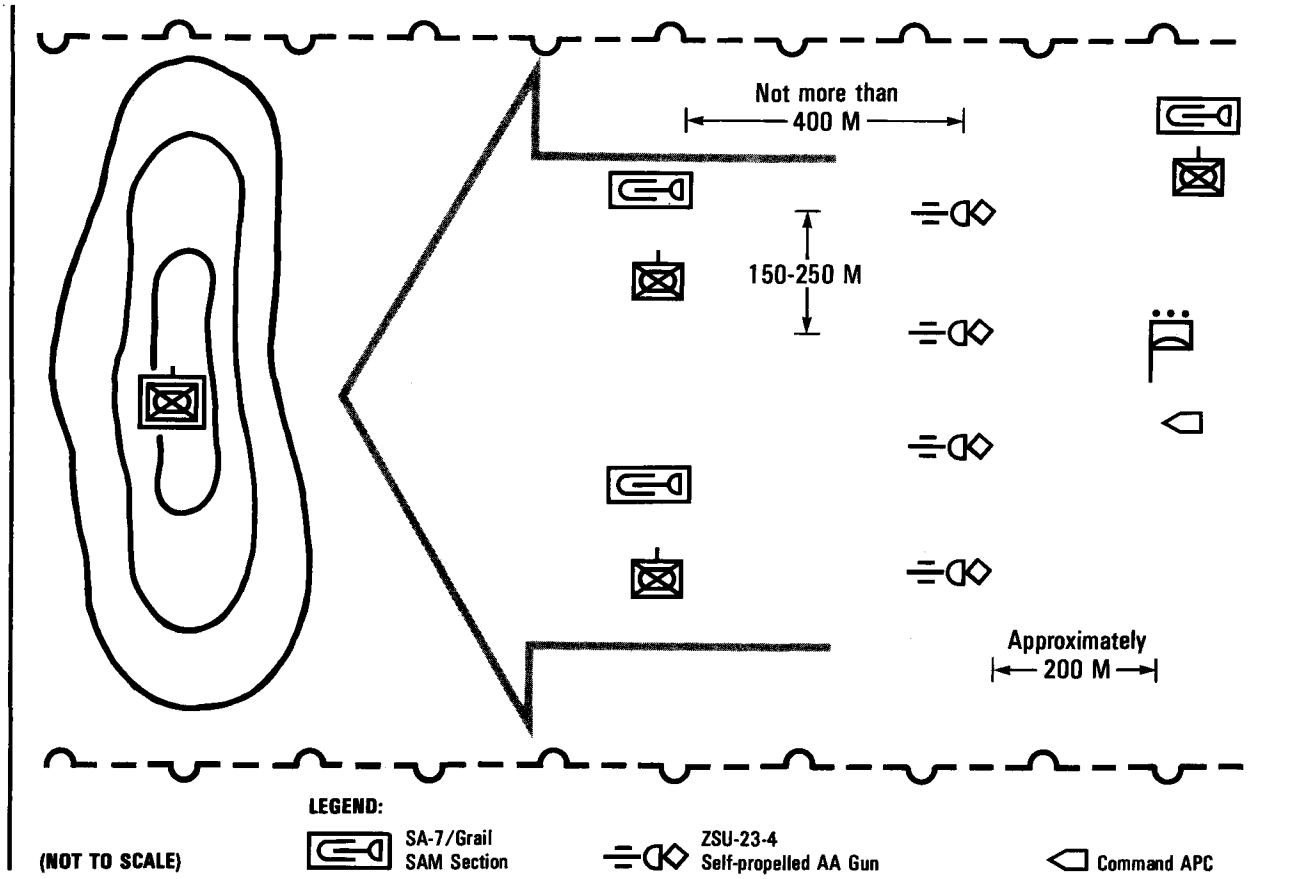
In an attack, the exact location of tactical air defense weapons depends on the mission of the supported unit, the attack formation chosen by its commander, and considerations of terrain, fields of fire, and observation. If the maneuver unit is attacking on a broad frontage, sections of two ZSU-23-4s are usually deployed in a line formation to provide protection to the dispersed elements of the supported unit. When attacking on a narrow frontage, the two ZSU-23-4 sections of the platoon are deployed in column to provide greater control and increased concentration of platoon fire.

SA-7 gunners ride in armored personnel carriers or the BMP. Employment of a BTR company's SA-7 gunners in a group, close to the company commander, is preferred. It offers greater control and increased probability of a target's destruction. It also reduces the possibility of firing on a friendly aircraft.

When two maneuver battalions attack on line in the first echelon of a regiment, each normally is supported by a ZSU section. While the ZSU-23-4 sections remain within mutually supporting range, they are located far enough apart to reduce the chances of their simultaneous destruction by conventional weapons. The two guns of each section usually are located from 150 to 250 meters apart to insure adequate freedom of fire for engaging low flying targets (see below).

The air defense platoon command element usually follows the ZSU-23-4 sections at a distance of approximately 200 meters. Trucks carrying additional ammunition for the ZSUs follow at a distance of 1.5 to 2.5 kilometers to the rear of the firing sections.

Air Defense Support for a Motorized Rifle Battalion Assault



Basic employment techniques for air defense weapons in a meeting engagement do not differ significantly from those for the attack. Two ZSU-23-4s of the platoon normally are placed in a regiments' advance guard. SA-9 SAMs and any reinforcing elements from the division's air defense regiment most likely remain with the maneuver regiment's main force. Air observers are posted on all vehicles, and SA-7 gunners are prepared to engage designated targets in their sectors of observation and fire.

An additional concern is the need to protect air defense weapons, especially ZSU-23-4s with the advance guard, from enemy direct fire. The advance guard battalion also may be protected by SA-6 or SA-8 SAM batteries operating from the regiment's main body.

A motorized rifle battalion in a pursuit may be augmented by air defense elements from its regiment or possibly a battery from the division's air defense regiment. Air defense during pursuit is especially important, since the enemy will likely use air power to reduce the rate of advance and the strength of pursuing Soviet forces.

SUPPORT IN THE DEFENSE

The Soviets believe that the motorized rifle and tank battalions in a division's defending first echelon regiments will be priority targets for attacking enemy aircraft. Therefore, regimental air defense weapons are deployed well forward, with the ZSU-23-4 platoon usually supporting first echelon motorized rifle battalions. The SA-9 SAM platoon is probably located in the rear of the first echelon battalions or in the forward area of the second echelon, protecting the regiment's artillery battalion and command post. If the air threat is great, batteries of the divisional air defense regiment may be allocated to any of the maneuver regiments. Remaining divisional air defense batteries protect the division main command post and division artillery and rocket units.

A ZSU-23-4 platoon leader normally is given a mission order by his air defense battery commander to provide protection to a specific maneuver battalion or battalions for a given period of time. During this time, the ZSU-23-4 platoon leader reports directly to the maneuver battalion commander. The platoon leader also maintains communications with his battery headquarters and the division's target identification and warning net.

The maneuver battalion commander has overall responsibility for the organization and conduct of air defense by his own battalion and any attached elements. The ZSU-23-4 platoon leader is responsible only for the performance of his own platoon.

When the platoon leader reports to a maneuver battalion commander, he is informed of the battalion's mission and disposition and the commander's tactical plan. He may receive further instructions from the battalion commander, and they may conduct a joint terrain reconnaissance.

The platoon leader identifies likely routes of approach for enemy aircraft, paying special attention to routes suitable for low-flying aircraft and helicopters. Positions for air defense weapons are also reconnoitered. If the battalion commander has directed that air defense ambushes and roving units are to be deployed, the ZSU-23-4 platoon leader designates primary and alternate positions on a map and establishes schedules for their movement. These positions and schedules are then coordinated with the battalion commander.

Battalion air defense preparations begin at the company level. Air observation posts are established in each company area close to the command observation posts, on terrain affording good visibility or along likely routes of enemy air approach. Schedules for rotating air observers are established, and sectors of observation and fire are designated for each post to maintain 360-degree observation of the air space surrounding the battalion's defensive area. SA-7 SAM firing positions are established in each motorized rifle company's area. These positions often are collocated with air observation posts near the perimeters of the companies' positions to extend the engagement envelopes as far as possible. While tank companies have no organic SA-7 SAMs, they do establish their air observation posts as part of the battalion's air defense warning system.

Company commanders determine sectors of fire for employment of massed fires of small arms and vehicle-mounted weapons, including tank-mounted antiaircraft machine guns. ATGMs can be used to engage troop-carrying and armed helicopters. Signals for warning and engagement are coordinated, with primary reliance on visual signals and field telephone communications. Finally, personnel camouflage their vehicles, equipment, and positions as a passive air defense measure.

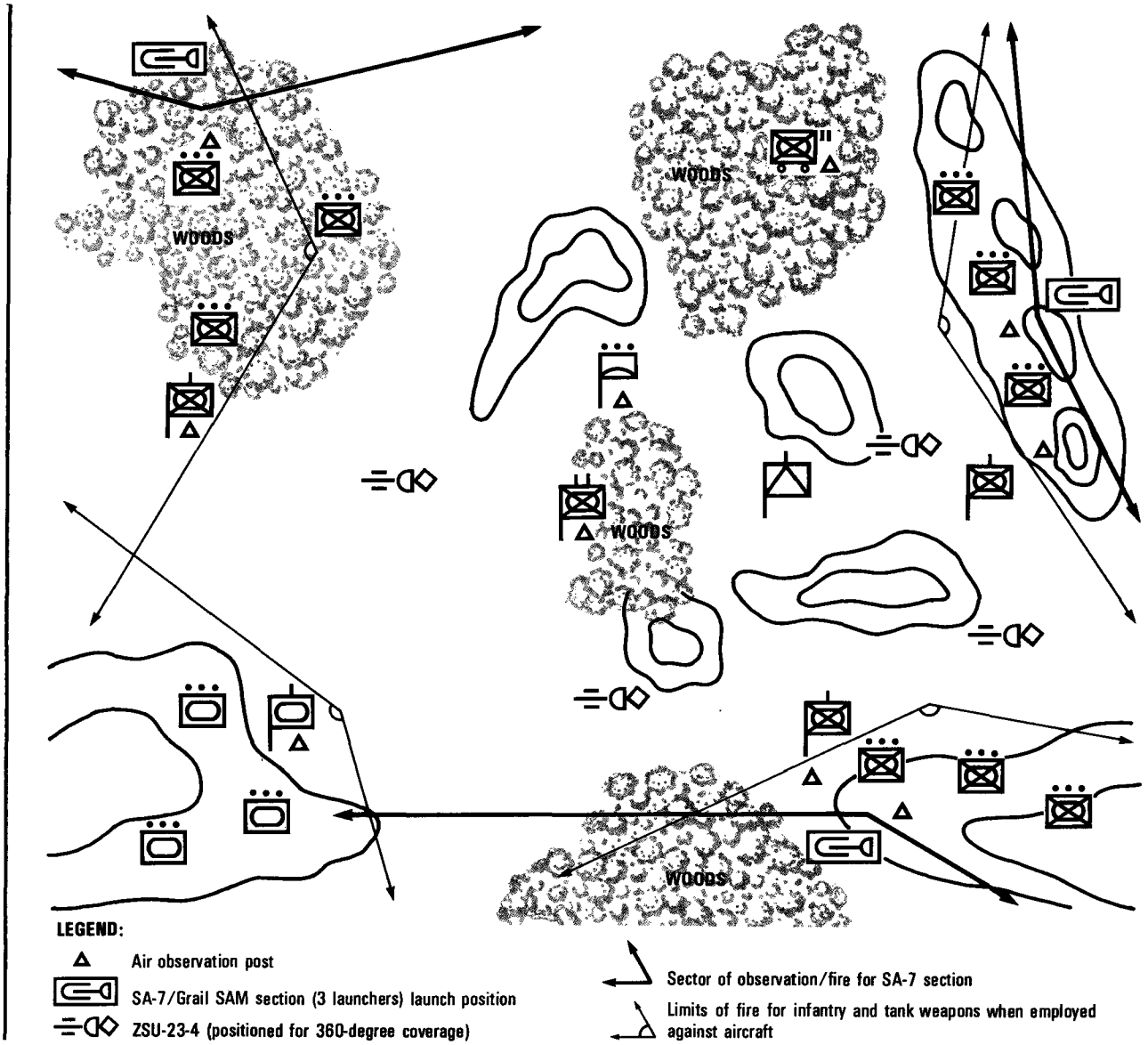
As in other combat actions, the ZSU-23-4s may be deployed in pairs (sections), with pairs of guns not more than to 1,500 meters apart. Positions for the ZSU-23-4s are usually well within a battalion's defensive area, which affords them a measure of protection from enemy observation and direct ground fire. This enables the ZSU-23-4s to provide protection to the entire battalion. Air observation posts are established in the

battalion rear area and at the battalion command observation post. The ZSU-23-4 platoon or section command post usually is located near the battalion command observation post.

The fires of the battalion's organic and attached air defense weapons are combined into an integrated air defense fire plan. The division target identification and warning network provides information about the enemy air situation. (Note the graphic illustration below.)

The battalion's air defense capabilities are only part of an overall air defense system. Preparations in the battalion are directed primarily against low-flying aircraft that have penetrated the overall air defense network and are attacking the battalion. Before aircraft can reach the outer limits of the battalion's air defense network, they must penetrate the SAM engagement envelopes of the SA-4 SAMs of *front* and army, the SA-6 or SA-8 SAMs of the division, and the SA-9 SAM platoon of the maneuver regiment's air defense battery.

Air Defense of a Motorized Rifle Battalion in a Defensive Posture



The Soviets believe that it is better to engage a hostile aircraft prematurely and waste some ammunition than to wait and allow the aircraft to expend its ordnance from an advantageous position. Aircraft are fired on continuously as long as they remain within range.

Aircraft posing the greatest threat are engaged on a priority basis. The preferred engagement technique is to continue firing at an already engaged target rather than to switch from target to target—unless a later-acquired target seriously threatens the air defense elements. Air observers and weapon crews outside the attacked sector maintain observation and readiness to fire to preclude enemy success through simultaneous air attacks from several directions.

Company commanders usually direct the firing of their SA-7 SAMs and the employment of massed small arms fires. A helicopter usually is engaged by the massed small arms fire of a single platoon; high-performance aircraft are engaged by all weapons of the company. Between attacks, air defense weapons are repositioned to reduce the likelihood of destruction in subsequent attacks and to deceive the enemy as to the strength and composition of air defense units.

Second echelon battalions of a motorized rifle regiment are located several kilometers behind the FEBA and usually do not have attached air defense elements. They benefit from the efforts of all air defense elements located to their front.

Second echelon maneuver regiments develop their air defense plan in coordination with the division's chief of air defense. It is also likely that one or more of the division's air defense batteries will be located in the defensive areas of these second echelon regiments.

In all cases, second echelon regiments take both active and passive air defense measures. Air observation posts are established, SA-7 SAM and massed unit fires are planned, and camouflage measures are taken.

One problem identified by Soviet writings on air defense of defending maneuver units is that their commanders often forget that air defense is an integral part of combined arms actions. Such an oversight can result in a poorly organized system of air defense, uncoordinated actions by organic and supporting air defense elements, and unnecessary losses of personnel and equipment to enemy air attacks.

Lesser problems involve maintaining continuous air observation and insuring that first echelon units have current and accurate information about the air situation. A problem less frequently mentioned is the high ammunition and missile expenditure rate that must result from the policy of early, multiple, and prolonged engagement of targets.

Air defense units play a significant role in defending Soviet ground forces against attacks by enemy airborne and airmobile troops. When an enemy airborne operation is detected, *frontal* aviation attempts to intercept and destroy enemy transport aircraft while they are at the marshaling airfields and en route to the drop zones. *Front,* army, and division SAM units engage the transport aircraft entering their respective air defense zones. Regimental air defense units near the drop zones also engage the transport aircraft. The ZSU-23-4 fires on paratroops and equipment descending to the ground. Vehicle-mounted machine guns and small arms fire also are used in this role.

Enemy airmobile units are engaged primarily by antiaircraft artillery and SA-7 and SA-9 SAMs. ZSU-23-4 guns are effective in combating airmobile forces flying at very low altitudes to avoid radar detection. The importance of visual surveillance in the early detection of these approaching helicopters is stressed repeatedly in Soviet writings. Vehicle-mounted machine guns and small arms fire also engage helicopters. Additionally, antiaircraft artillery attack enemy airborne and airmobile forces that have landed.

AIR DEFENSE RECONNAISSANCE

The Soviet concept of reconnaissance in air defense includes airspace surveillance and evaluation of the terrain for suitable weapon positions and likely routes of approach for low-flying aircraft—both ground-attack fighters and armed helicopters. Surveillance of the surrounding air space is continuous to maintain current data on the enemy air situation.

Terrain reconnaissance usually is conducted by the commander of the supported unit and the commander of the supporting air defense element. They conduct a preliminary map reconnaissance to tentatively identify positions for deployment of air defense weapons in defensive areas, along routes of march, or in areas to be seized by advancing Soviet forces. Significant emphasis is placed on identification of all potential attack routes for low-flying enemy aircraft of all types. Routes of approach suitable for armed helicopters and positions from which these helicopters might employ ATGMs are of special concern. The Soviets consider armed helicopters to be a serious threat to their tank and motorized rifle forces. Soviet commanders are trained to observe areas masked by trees or folds in the terrain that might be used by enemy aircraft using nap-of-the-earth (NOE) flight techniques to avoid radar detection.

The Soviets use electronic and electro-optical means and visual observation to conduct air

surveillance. Radar is used for technical surveillance, providing an all-weather detection capability.

Whenever possible, preliminary target data is passed from higher-level radar units to air defense commanders and their firing batteries. This reduces the vulnerability of battery radars and radar-equipped gun carriages and missile launchers to electronic countermeasures. Ideally, only aircraft that have been positively identified as hostile are engaged.

The Soviets are well aware of developments in electronic countermeasures and radar-homing ordnance. Radar personnel receive extensive training in countermeasures against enemy aircraft that use jamming devices and radar-homing weapons.

The development of technical reconnaissance means has not reduced the importance of visual reconnaissance. Soviet commanders are taught that an effective system of visual surveillance often may provide the first warning of an enemy air attack—especially one conducted by attack helicopters using NOE flight techniques. This is especially true at the subunit level.

Air observers are posted in all units operating close to enemy forces or in areas where enemy air attack is likely. Visual air surveillance is conducted on a 360-degree basis, and observers are assigned sectors of air space to monitor. According to the Soviets, an aircraft can be detected at ranges from 2 to 5 kilometers when the observer is assigned a 60- to 90-degree sector of observation and at ranges of 6 to 7 kilometers when assigned a 30-degree sector. Of course, terrain and visibility affect these distances. Using binoculars can increase detection ranges to about 12 kilometers. Aircraft flying at high altitudes may be detected at ranges of up to 50 kilometers when more sophisticated optical rangefinding equipment is used.

PROTECTION OF MARCH COLUMNS

The Soviets anticipate that their units may be subjected to heavy attacks by both ground-attack fighters and armed helicopters when conducting road marches. Accordingly, marching regiments are protected by their organic air defense weapons and by air defense weapons from their division.

Air attack is considered likely at chokepoints where rapid movement is impeded by terrain or other obstacles. These chokepoints include bridges, mountain passes, built-up areas, and similar locations.

Air observers are designated on all vehicles, and air defense elements, including SA-7 gunners, remain ready to engage targets at all times. Vehicle-mounted weapons are also employed. To reduce the likelihood of detection of the column by enemy electronic intelligence (ELINT), radars on the vehicles may not be used unless the requirement for their use outweighs the risk of detection. Additional radars from the division's air defense regiment may be used if increased radar coverage is desired. Two radars are usually used, and they are set up at critical points along the march route. Usually only one radar moves at a time. If the commander decides not to use the additional radars during the march, one is placed in the advance guard and the other in the main force of the unit. Both remain ready for use at any time.

SA-7 gunners engage low-flying aircraft under the direction of their company commanders. Individual SA-7 gunners are assigned specific sectors of observation and fire to preclude several gunners engaging one target while additional targets approach from other directions. Tight control over the SA-7 gunners reduces the expenditure of missiles.

Regimental air defense weapons, particularly the ZSU-23-4 SPAAGs, play a major role in the defense of units making tactical marches. While one or two pairs of ZSU-23-4s may be employed to protect units on the march, the use of all four seems to be the rule. ZSU-23-4s are employed within 1,500 meters of each other to insure mutual support. Individual self-propelled antiaircraft guns maintain at least 50 meters between themselves and other vehicles to insure an unobstructed field of fire for engaging low-flying aircraft. Targets can be engaged by the ZSU-23-4 moving at slow speeds or during the short halt which yields more accurate fire. Whenever a column stops, even for brief periods, the ZSU-23-4s pull off to the right side of the road with the rest of the column and remain ready for action.

When the threat of air attack is great, or when the commander directs, weapons of the division's air defense regiment are employed to protect columns. The SA-6 and the SA-8 SAMs—especially the SA-8, with its high degree of road mobility, amphibious capability, and integral radars—are well suited to providing air defense protection for columns. These weapons provide large engagement envelopes which could have a significant impact on enemy aircraft using limited-range, standoff weapons. It is highly likely that SAM batteries are used to protect columns, especially those moving up from the rear.

Air defense batteries relocate as necessary to provide continuous and effective protection to the supported unit. Soviet commanders maintain effective protection by leaving at least one battery in firing position to cover for the one(s) moving. Air defense elements attached to a maneuver unit usually move as a part of that unit.

AIR DEFENSE AMBUSHES AND ROVING UNITS

Soviet commanders employ special techniques to increase flexibility and effectiveness in their air defense. Among these are the use of air defense ambushes and roving air defense elements. Air defense elements used for both these techniques are similar in task organization and usually consist of a single antiaircraft gun, section, or platoon. SA-7 SAM squads also may be used independently, or with other weapons.

Air defense ambushes and roving units are used to cover gaps in air defenses, to provide air defense coverage on less likely approach routes for enemy aircraft, and to deceive the enemy as to the disposition of other air defense elements. These tactics often are employed when the air defense assets are thought to be inadequate.

Air defense ambushes are most frequently positioned along less likely but possible approach routes for enemy aircraft. They usually consist of one or more ZSU-23-4s or SA-7 SAMs. The ZSU-23-4, with its inherent mobility and high rate of fire, is especially well suited for both ambushes and roving units. When necessary, radar elements of the divisional air defense regiment may support a unit operating from ambush.

Engagement is made only of those targets that approach on the designated route or in self-defense. Air defense units are immediately repositioned after engagement or discovery by the enemy.

Employment of roving air defense units is similar to that of ambushes. The primary difference is that while an ambushing unit lies in wait for approaching enemy aircraft, a roving unit moves to the most likely areas of enemy air attack and occupies a series of predesignated positions in the supported unit's area. The roving unit occupies these positions according to a prearranged schedule or on order of the air defense unit commander.

The Soviets believe that sudden and intense ground fire from an unexpected location or direction can be highly effective in destroying attacking aircraft. They believe that such fire can seriously degrade air crew performance and cause them to fire their weapons prematurely or force them to break off their attack. The Soviets also think that ambushes and roving air defense units can make the enemy believe that significant air defense elements are located in areas where there are actually only a few weapons. This can reduce the effectiveness of enemy reconnaissance and the likelihood of enemy air attack in the area concerned.

PROTECTION OF RIVER CROSSINGS

Soviet air defense plays a major role in river crossings by protecting the crossing site and forces from air attack. They accomplish this mission by creating envelopes of protected air space above and around the crossing sites.

SA-7 gunners generally operate with the maneuver companies. As the battalion approaches the near riverbanks, SA-7 gunners move with the motorized infantry and are posted at key locations with assigned sectors of observation and fire. During the crossing, the SA-7 gunners cross with the companies, ready to engage enemy aircraft. On reaching the opposite bank, they are again assigned positions and designated sectors of observation and fire. The SA-7 gunners may also take part in air defense ambushes if terrain or threat considerations so dictate.

A platoon of four ZSU-23-4s often accompanies a reinforced motorized rifle battalion operating as an advance guard of a motorized rifle regiment.

During the motorized rifle battalion's march to a river, the ZSU-23-4 platoon usually moves at the rear of the forward security element. Normally, the ZSU-23-4 platoon is employed in two pairs. In some situations, only one pair may be located with the forward security element while the other pair is with the advance guard main body.

If the battalion is opposed while approaching the near bank, the ZSU-23-4s may engage ground targets. However, their vulnerability to antitank and other direct fire weapons makes such employment very risky. Air defense commanders seek alternative approach routes to the near bank if the threat of direct fire is significant. The ZSUs take up firing positions on the near shore, usually 300 to 500 meters from the water's edge, and not more than 1,500 meters apart. From these positions, they engage aircraft attacking the crossing site and, if necessary, support crossing elements with direct fire.

After motorized rifle subunits have crossed, ZSU-23-4s usually cross the river with the tank company on ferries or by bridge. While crossing, the ZSU-23-4s remain ready to engage attacking aircraft.

On reaching the far shore, they take up firing positions jointly agreed on by the maneuver unit commander and the ZSU-23-4 platoon commander. Air defense assets on the far shore at this point in the crossing consist of an SA-7 squad and the two ZSU-23-4s. These air defense weapons provide an engagement envelope above and around elements of the battalion on both sides of the river. As the rest of the battalion crosses and the regiment's main body reaches the near bank, ZSU-23-4s on the near shore usually are replaced by other air defense weapons—possibly by the regiment's SA-9 SAM platoon. Replacement of the ZSU-23-4s by other regimental or divisional air defense

weapons allows the ZSU-23-4 platoon to move forward and continue supporting elements on the far shore.

Major problems identified by Soviet articles discussing air defense of river crossings are how to insure comprehensive radar and visual observation and how to deal simultaneously with threats on multiple axes of approach. Other problems include difficulties in maintaining continuous 360-degree fire coverage and providing adequate ammunition resupply to firing elements on the far shore. The ammunition problem is especially critical for the ZSU-23-4s. Commanders are cautioned often to be sure that ammunition carriers are moved to the far shore to guarantee continuity of fire. The Soviets believe that these problems can be overcome and that well-trained, well-led air defense units can successfully support river crossings.

AIR DEFENSE OPERATIONS IN MOUNTAINOUS TERRAIN

Air defense units operating in mountainous terrain have unique problems. The rugged terrain makes it extremely difficult to maintain the unit integrity of both maneuver and air defense units. This makes maintaining comprehensive air surveillance and air defense fire support more difficult and results in a greater degree of decentralization than normal. These difficulties affect fire control and operations of air defense batteries, platoons, and even sections. The importance of the SA-7 is greatly increased in mountain operations.

Because of the restrictive nature of mountainous terrain and the typically limited road networks in such areas, maneuver units often have to move in several widely separated columns. Air defense weapons are placed forward in each column. Radar equipment and ZSU-23-4 SPAAGs, when present, usually move from high point to high point along routes of advance to obtain the best radar coverage, observation, and fields of fire. SA-7 SAM squads probably have greater freedom to engage than is normally the case. At times, authority to engage is even delegated to section leaders. Greater use is made of air defense ambushes using ZSU-23-4s, SA-7 SAMs, and the fires of motorized rifle units. Elements of the division's air defense regiment may directly support one or more of the division's columns. The employment of highly mobile SA-6 or SA-8 SAMs in divisional air defense regiments greatly increases the capability to support mountain combat.

AIR SPACE CONTROL

The Soviets have a multitude of air defense systems in their forces. Soviet commanders are concerned with the division of air space among the various systems. To accomplish this, they use a combination of geographical, altitude, and time divisions of the air space to be defended.

A hypothetical geographic division of the air space might include establishing a boundary parallel to and well forward of the FEBA, beyond the maximum range of SA-4 SAMs. *Frontal* aviation engages enemy aircraft forward of this boundary, and ground-based air defense systems engage aircraft to the rear of this boundary. There also may be "safe corridors" through the engagement envelopes of ground-based systems for safe passage of Soviet aircraft beyond the line of contact. These corridors may be used in conjunction with time periods in which SAM units refrain from engaging aircraft unless directly attacked. Time periods also may be established during which all aircraft are fired on or during which no aircraft is fired on.

WEAKNESSES

The greatest potential weaknesses of the Soviet air defense system are that command and control could fail under the intense pressures of combat; Soviet commanders might fail to vigorously push their air defense assets forward at the same pace as their maneuver forces; and it may be difficult to supply air defense units with sufficient ammunition and repair parts during prolonged, fast-moving offensive operations.

If the air defense "umbrella" is not moved forward when necessary, Soviet tanks and motorized rifle units become exposed to enemy ground attack aircraft and armed helicopters, and they may suffer major losses. The only alternative to taking these losses would be to slow the pace of the advance, which would significantly reduce chances of success.

There is also the question of how Soviet air defense systems, including the personnel manning the weapons and equipment, will react when subjected to intensive and repeated attacks by large numbers of modern aircraft using sophisticated electronic warfare equipment and highly lethal advanced ordnance that will probably impose a high attrition rate on air defense units.

An underlying theme in Soviet writings is criticism of some maneuver unit commanders for failure to recognize fully that air defense is an integral element of combined arms combat. In tactical exercises, maneuver unit commanders often "forget" about the air threat and fail to employ their air defense capabilities effectively.

Other problems frequently mentioned are failure to organize effective and continuous air surveillance and

failure to supply air defense units with sufficient ammunition and other materiel. In both cases, the effectiveness of these units is greatly reduced.

Air defense command and control relationships are subject to conflicting pressures for centralization and decentralization. Factors favoring centralized control include the greater efficiency and effectiveness of centralized target detection systems and the increased ranges of modern SAMs. Factors favoring decentralized control include the need for flexibility to support fast-paced operations by maneuver units and the many unforeseen contingencies that can arise in local situations.

The regimental air defense staff sometimes plays a role in the employment of company air defense weapons, and there may be occasions when the division air defense staff dictates how maneuver regiments employ their air defense batteries. There also may be situations in which army or *front* directs the employment of divisional air defense assets. In general, the Soviets impose enough centralization to optimize efficiency while allowing sufficient decentralization for effectiveness.

Caution must be exercised when attempting to balance the "weaknesses" outlined above against the overall capabilities of the Soviet air defense system. Most of these weaknesses have been clearly identified by the Soviets themselves, and they are working to correct them. The most pervasive shortcomings appear to be with individual commanders rather than with system failures. It is highly unlikely that these problems would be so prevalent that they would seriously degrade the overall effectiveness of the Soviet air defense system in combat.

TRENDS

The most evident trends in Soviet tactical air defense developments in recent years have been the progressive increase in the size of the engagement envelope and the lethality of the weapons. New weapons systems are being introduced and modifications are being made to previously fielded systems. The SA-8 has been modified to carry six, rather than four, ready-to-fire missiles. The SA-13, currently being introduced into service to replace the SA-9, is mounted on a tracked chassis and has good cross-country mobility. The more recently fielded weapons systems have redundant missile guidance capability, providing an enhanced ability to conduct successful engagements in a sophisticated countermeasures environment.

Continuing qualitative improvements are expected. An improved man-portable SAM can be expected. While the ZSU-23-4 is an exceptionally good weapon, its limited range, lack of an amphibious capability, light armor protection for crew members, and reduced effectiveness against more modern aircraft make it a likely candidate for replacement. Western developments in remotely-guided standoff weapons will probably influence future Soviet air defense weapon development.

Overall, the division's air defense capabilities have progressed from a point defense system to an area defense system. The combination of the SA-6 and SA-8 SAMs with the area defense weapons of *front* and army and the point defense weapons within the division gives Soviet ground forces a comprehensive, overlapping, and mobile area air defense system.

With the increasing lethality of air defense weapons and their deployment at lower levels in the force structure, effective control of the air space becomes more complex. The Soviets stress the need for the various air defense forces to adopt common terminology and to conduct operations with a single integrated plan under unified command and control. This emphasis on unity of effort may be reflected in the apparent reorganization of air defense elements formerly under *PVO Strany* and PVO of the Ground Forces into a single service, the Air Defense Forces *(Voyska PVO).*

Soviet ground-based tactical air defense systems present a formidable threat to any potential air enemy. Soviet air defense efforts appear to be nearly "state of the art" when viewed as a whole, and they are unsurpassed by any systems currently deployed by other nations. Soviet air defense weapons are deployed in variety and quantities unmatched by any other military force. Soviet air defense doctrine is comprehensive in threat evaluation and formulated response. It is cohesive in organization and equipment. It responds effectively to ground forces' support requirements.

CHAPTER 12

AIR SUPPORT

CONCEPT

Fixed-wing combat aircraft and attack helicopters provide air fire support to Soviet ground maneuver formations. Air support assets are an integral element of combined arms formations at *front,* army, and division levels. The majority of the aircraft and helicopters were introduced during the past decade and have significantly increased offensive air support capabilities.

Tactical fixed-wing aircraft support *fronts* and armies in theaters of military operations (TVDs). These assets accomplish the missions of air defense cover, air reconnaissance, and ground support. The aircraft also can conduct battlefield and rear area interdiction.

The support role of helicopters has greatly expanded concurrently with the rapid expansion of the number of helicopters. Attack helicopters are routinely employed in exercises to provide immediate air support to motorized rifle and tank regiments and battalions. Helicopters also perform a variety of logistic, intelligence, liaison, and communications functions. In addition, helicopter support for airmobile operations is a common feature of major Soviet field exercises.

The flexibility and maneuverability of tactical aviation assets give them a key role in modern combat. According to the Soviets, aviation has particular advantages over other combat forces in that it can—

- Conduct independent operations.
- Execute rapid, wide maneuvers.
- Combat enemy air, ground, and naval forces.
- Execute missions under diverse tactical and environmental conditions.
- Concentrate forces quickly for the execution of unexpected missions.
- Be redirected after launch to a different target.

Tactical aviation assets can provide continuous fire support to ground maneuver formations. Air fire support is responsive to rapid changes in the battlefield situation and can keep pace with mobile ground formations. Furthermore, aviation assets generally can strike targets that are out of range of artillery.

AIR SUPPORT DOCTRINE

The Air Operation

A massive air operation is the Soviet approach to the initial stage of a nonnuclear theater offensive. It employs initial, massive nonnuclear air strikes throughout the theater of operations.

The increase in the number of Soviet ground attack aircraft in the last decade and the concurrent improvements in their range, armaments, and avionics have provided Soviet military strategists with a viable, nonnuclear offensive option for gaining the operational initiative and creating the conditions of victory in the period directly after the outbreak of hostilities. The concept of the air operation entails Soviet fixed-wing, ground attack aircraft from *frontal* aviation and intermediate-range aircraft from strategic aviation and naval aviation committed to a series of massive strikes against priority theater targets over a period of several days. With a small proportion of available air resources assigned to the neutralization of enemy air defenses and the creation of approach corridors, the majority of the aircraft attack enemy nuclear weapon systems, command and control centers, and airfields.

During the initial hours of the air operation, the commitment of fixed-wing aircraft to priority theater targets precludes their use for direct air support of ground force operations, and ground force commanders rely on combat helicopters to fill this role. Integrated fires of artillery, attack helicopters, and operational and tactical missiles assist in the creation of corridors through the enemy's forward air defenses. Missile strikes and attacks by air assault, special purpose, and partisan forces are planned against airfields, nuclear delivery and storage sites, and command and control facilities.

The air operation is simultaneously a concentrated effort to establish air superiority and a principal component of the overall Soviet effort to achieve total fire superiority to deprive the enemy of his nuclear attack capabilities. The air operation is distinguished from a general offensive in that the strikes are not in direct support of a coincidental advance by ground maneuver formations.

Due to its scale, an air operation is probably a TVD-planned and directed operation. However, an air operation on a smaller scale may be conducted in the course of a *front* operation to establish local air superiority.

As the number of priority targets is reduced in the course of the operation, ground attack aircraft are reassigned to the air support role according to a prearranged plan. Through this plan the ground force commanders regain the use of air support resources.

Air Support of Ground Forces

Besides the air operation at the onset of theater-level hostilities, Soviet doctrine calls for air support of ground forces in offensive operations. The Soviets recognize four stages of air support within an offensive operation: support of movement forward, air preparation, air support, and air accompaniment, which correspond to the phases of the fire support plan. The major difference between the phases is their time of deployment, although there are some differences in targeting, command, and aircraft used. (See page 12-8, Support in the Offense.)

ORGANIZATION AND EQUIPMENT

Soviet tactical aviation assets are organized on a functional/mission-related basis. The Soviets consider that homogenous formations of fighters, fighter-bombers, reconnaissance aircraft, etc., increase firepower and strike capability, promote firm control and maneuverability, and enhance the capability to conduct sustained operations. Tactical aviation assets consist generally of fighter, fighter-bomber, helicopter, and reconnaissance units, as well as miscellaneous support units.

The distribution of these assets among the different levels of command is currently in flux. The ongoing aviation reorganization shows an apparent desire to centralize control over most fixed-wing tactical aircraft and to decentralize control over the attack helicopters.

Frontal aviation organizations are located in 12 of the 16 military districts within the USSR and with each of the Groups of Soviet Forces in the GDR, Poland, Czechoslovakia, and Hungary. The strength and composition of the aviation assets of a *front* can vary considerably. *Frontal* aviation may include two or three air divisions and independent regiments of reconnaissance aircraft.

An air division typically contains either fighter or fighter-bomber aircraft, usually organized into three regiments of three squadrons each (see FM 100-2-3). Divisions are commanded by major generals or colonels; regiments by lieutenant colonels or colonels; squadrons and flights by majors and captains, respectively.

Concurrently with the rapid expansion of rotary-wing assets, the Soviets have organized a steadily increasing number of independent attack helicopter regiments (see FM 100-2-3). These independent attack helicopter regiments are apparently a principal component of what the Soviets refer to as army aviation, and are probably subordinate to army-level maneuver force commanders.

The aviation element in selected motorized rifle and tank divisions has been upgraded to squadron strength. The division aviation element formerly contained six to eight light, general-purpose helicopters. Selected divisions now have an organic aviation squadron that includes up to 12 HIP and HIND ATGM-equipped attack helicopters, in addition to the general-purpose helicopters.

COMMAND AND CONTROL

The command and control structure of *frontal* aviation is integrated with that of the ground forces to insure close and continuous coordination in a combined arms offensive. At *front* level, the deputy commander for aviation serves as chief of aviation on the *front* staff.

Aviation Control Element

At army and division level, an aviation control element normally is assigned to the staff of the commander. At army, this element generally consists of these personnel: an air controller, an intelligence officer, a liaison officer, and communications personnel. Aviation control elements at division level are similar to, but smaller than, those at army level.

Aviation control elements advise on the use of air assets, transmit air support requests to the aviation organizations, maintain communications and control with aircraft in the battle area, and advise the commander of air reconnaissance information. The aviation control element is separated into two sections. Each of these sections has a specially-equipped BTR-60. One section chief is collocated with the commander, and the other is collocated with the chief of staff.

Forward Air Controller

A forward air controller is assigned to ground force regiments when fixed-wing aircraft or combat helicopters are assigned for their support. The Soviet forward air controller is an air forces officer and generally a pilot. His tasks are to advise the regimental commander, to serve as the communications link between the regiment and the aviation control element at division, and to direct attacking aircraft to their targets. He is equipped with a vehicle and the equipment required to maintain communications with the division and the airfield. The forward air controller can call up air support at the request of the supported ground unit commander.

It is rare to find an air representative in a ground force battalion. However, a forward air controller may be assigned when air support is provided in a particularly important or difficult battalion action. Normally, however, a battalion commander has no direct communications with air support resources.

For mutual recognition and target designation, radioelectronic means such as radio beacons are used widely by the forward air controllers. Signal flares, colored smoke, beacon lights, and cloth panels are used when there is visual contact. When aircraft are operating against objectives that cannot be observed by ground troops or forward air controllers, target designation is carried out mainly using reconnaissance information obtained by the aircraft crews themselves. The crews use flares, aircraft maneuvers, and radioelectronic means for signaling, for communicating, and for making mutual identification.

Difficulties in Coordination

Judging from Soviet military writings, the method of coordination between the air and ground forces, especially at lower levels, is not always successful. The procedures worked out by air and ground force commanders before the launch of combat air missions often inhibit flexibility in mutual cooperation and prevent changes required by the situation that evolves after the missions are underway. Problems also arise because many ground force commanders do not have in-depth knowledge of the combat capabilities of aviation, and air forces commanders often are unfamiliar with the development of the ground battle except in general terms. Ground force unit commanders sometimes hesitate to call for air support unless the support has been planned beforehand. As one Soviet commentator stated recently, "The aviators fight according to their rules, and the combined arms troops according to theirs." The plans for mutual cooperation worked out before the actions are often incomplete and account for only the situation when aircraft approach the FEBA. Lower-level ground force commanders are not always informed of the fighter-bomber and combat helicopter resources allocated for immediate missions. The combined arms commanders do not always know the location and condition of aviation during the battle, the aviation's readiness to commit reserves, or the types of air strikes available. A failure by higher headquarters to supply damage assessment data to ground commanders causes unnecessary firing at previously destroyed targets.

To resolve the problems of mutual cooperation successfully, Soviet military experts suggest wider adoption of automated control systems to speed and simplify collecting, transmitting, and processing information at all levels of command and control. More frequent joint tactical briefings, technical conferences, and meetings between lower-level ground force and air commanders also are suggested in Soviet military publications.

Night and Weather Conditions

At present, the Soviets are striving to increase the effectiveness of air support in poor weather and at night. Soviet air operations slow considerably under these conditions because of inadequate aircraft and ground-based equipment and shortcomings in flight personnel training. Also, some of the mutual identification and target designation systems used during complex weather conditions and for night flying are unsophisticated. The Soviets are evidently making efforts to correct these shortcomings. It is believed that about 20 percent of the third-generation, fixed-wing aircraft introduced in the 1970s and *frontal* aviation's combat helicopters are equipped with radioelectronic and infrared instruments. This equipment enables pilots to carry out sorties at night and in poor weather at low altitudes, and to search for, to detect, and to destroy targets. Even when modern, sophisticated equipment is used, the Soviets believe that—for air support of ground troops—it is important to train pilots to navigate by landmarks, to search for targets visually, and to determine the distances to targets without technical aids.

Effective *frontal* aviation operations in support of advancing troops depend a great deal on providing appropriate airfields. In some regions it is possible to use certain types of modern aircraft from unpaved airfields. Some captured enemy airfields also could be used. When appropriate airfields are available, third-generation aircraft with their increased operational range and load capability enable the Soviets to provide air support to ground forces advancing at high speed. However, the Soviets have been seeking a type of aircraft that could operate from small, unpaved airfields and insure reliable air support to their ground forces. To help fulfill this need, the combat helicopter has emerged as a weapon system that can provide adequate support with the required flexibility.

PLANNING AND PREPARATION

Planning and preparation of air support before an offensive begin with the *front* commander's orders to his aviation commander(s) and to his army

commanders. The order specifies the air units to be committed, the ground armies to be supported, and the time of attack.

With this information, the combined arms commander and his aviation staff reconcile the air assets allocated by the *front* commander with the air support requirements of the ground force divisions. A maneuver division commander consults his aviation staff and develops his requirements by determining the targets to be attacked in his sector and estimating his immediate missions. Available air support is divided among preplanned, on-call, and immediate air support missions. An on-call mission is one in which the target may be predesignated, but the timing of the strike remains at the discretion of the ground force commander. If combat helicopters are to be used, air support is divided specifically between the fixed- and rotary-wing aircraft, depending on the targets, flight distances, and disposition of enemy antiaircraft defenses. After these determinations are approved and integrated with the *front* fire support plan, the aviation commander issues specific orders to his air divisions and regiments concerning targets, numbers of sorties, air approach corridors, communications codes, and mission timing. The air representatives at army, division, and regiment then confirm, for the respective commanders, the air resources allocated to them. Normally, the *frontal* aviation commander holds a percentage of his forces in reserve to meet unforeseen demands of division commanders. Division commanders also can withhold a percentage of their allocated air assets as reserves.

When a regiment has been assigned specific air support, the regimental commander explains his objectives to the commander of the supporting air unit and the forward air controller assigned to his regiment. He also seeks their recommendations.

Both *front* and army commanders pay particular attention to coordination of artillery and missile fire with preplanned and on-call air strikes so that artillery and missile fire can neutralize or suppress enemy antiaircraft defenses before the arrival of attack aircraft.

Coordinating the delivery of nuclear strikes is an important function for the ground and air commanders and their staffs. The commander of combined arms forces decides the employment tactics for nuclear weapons immediately within the ground force zone of advance to the depth of the range of his tactical missiles. He has to determine the target and the type, method, and time of delivery of nuclear strikes for his own missiles and for the carrier aircraft operating in the zone of advance. Aviation missions for delivery of nuclear strikes beyond the range of ground force missiles have to be assigned by the commander in charge of the entire operation (usually the *front* commander or above).

The Soviets normally maintain strict centralization in controlling air support resources. The supporting aviation will not always be under the operational control of the combined arms commander. Instead, air support resources may be apportioned into regiment-flights or aircraft sorties with the required quantity of munitions. These resources are allocated temporarily to the combined arms commander for the destruction of selected objectives. The combined arms commander may not know which air force unit or formation will accomplish the missions he requested.

Such centralized control allows a rapid reallocation of air support resources to accomplish the most important missions that suddenly arise during operations. Air force units that were not originally assigned for ground support may sometimes take part in delivering airstrikes against ground objectives. Decentralized employment of aviation (especially combat helicopters) will be used when operations are being waged on separate and disconnected axes. In that case, aviation assigned for air support will be transferred to the operational control of the combined arms commander, for employment according to his needs.

PREPLANNED AIR SUPPORT MISSIONS

As preplanned target assignments are received by air regiments and squadrons, they are studied closely to determine the best tactical approach. Large-scale maps and, in some cases, scale models of the terrain and targets are used to familiarize pilots with their assignments and to determine the optimum flight path and approach maneuvers.

Once airborne, the aircraft proceed to a designated checkpoint behind friendly lines where they confirm their target assignment with ground control. The emphasis placed on strict adherence to predetermined timing and flight paths indicates the probable use of "safe" corridors through friendly antiaircraft defenses. Aviation control elements and forward air controllers maintain communications with attack aircraft either directly or through radio relay aircraft.

As the aircraft approach the target area, forward air controllers establish communications and make sure targets are correctly identified by the pilots. When the target is in sight and has been confirmed by the forward air controller, the flight leader assigns individual targets and orders the attack. Aircraft follow the original flight plan through friendly antiaircraft defenses unless changed by ground control.

IMMEDIATE AIR SUPPORT MISSIONS

A request for immediate air support is submitted by the ground commander to the next higher headquarters and then forwarded through the chain of command. If a request for air support does not exceed the division commander's allocated assets, he can order the air strike through his aviation control element. Otherwise, army or *front* approval must be obtained, depending on the size of support requested.

As with preplanned support, the aviation control element at each command level participates directly in the evaluation of each air support request and in the coordination of the strike mission.

Aircraft designated for immediate missions can be airborne in holding areas or on the ground at airfields. Occasionally, an aircraft on armed reconnaissance patrol can be diverted to respond to an air support request within its area of operations. The Soviets recognize three levels of combat readiness for *frontal* aviation aircraft and crews. Aircraft in categories one and two respond to ground force requests for immediate air support. Before takeoff, pilots receive a short briefing that designates a checkpoint toward which to proceed and, possibly, the target location. On reaching the checkpoint, the pilots contact the air representative of the ground force units being supported to receive target designation or confirmation. Approach, attack, and recovery air control procedures remain the same as in preplanned air support missions.

AVIATION EMPLOYMENT

The Soviets emphasize that aviation can provide responsive and continuous fire support if its employment is guided by the following principles:

- The early attainment of air superiority.
- Coordination and integration with other arms.
- Employment in mass.
- Strict, centralized control.

Air-Ground Coordination

The Soviets consider that the coordinated use of the airspace over the battlefield and aerial delivery of ordnance close to friendly troops are among the most complex problems of modern combat. A consideration in their emphasis on early attainment of air superiority is simplification of the airspace management problem. To reduce air-ground coordination problems as much as possible, attack helicopters, fixed-wing ground attack aircraft, and artillery are not normally employed simultaneously in the same fire zone. Attacks by fixed-wing aircraft and artillery fire sometimes coincide in time, but they are assigned separate target sectors. Attack helicopters normally are employed after the completion of the artillery preparation. However, it is possible to use both simultaneously. In such a situation, the helicopters are assigned entrance and exit corridors parallel to and between artillery fire concentrations, and under the trajectory of artillery rounds.

The Soviets constantly emphasize that familiarity among the different elements of the combined arms force of each other's tactics and equipment, and relationships of mutual trust and understanding, must be firmly established in peacetime if effective cooperation and coordination is to be maintained during combat. The peacetime distribution of air assets among the military districts and groups of forces and within the force structure reflects the Soviet desire to establish a peacetime organization that closely corresponds to the wartime structure of combined arms formations. The aviation command and control structure is closely aligned with that of ground maneuver formations to insure effective, continuous, combined arms coordination.

The Soviets prefer to use experienced pilots from the supporting aviation unit as forward air controllers. They prefer to have qualified helicopter pilots direct helicopter strikes and qualified fighter-bomber pilots direct fighter-bomber strikes. However, either forward air controller may direct strikes by both types of supporting aviation so long as adequate air-ground communications can be established.

The forward air controller provides pilots the target location (either in grid coordinates or in relation to a predetermined reference point), the time to execute the strike, and information on the ground situation. The forward air controller normally does not attempt to mark the target, but frequently uses pyrotechnics to mark friendly troop locations. He may give the pilots a signal when they should climb and identify their target. The pilot has primary responsibility for pinpointing the target. However, the forward air controller assesses and adjusts the strikes for successive target runs. Communications security between the forward air controller and aircrews is maintained by the transmission of brief coded messages and prearranged signals.

Minimum safety distances between friendly troops and air strikes during peacetime exercises vary between 200 and 700 meters. In actual combat, the Soviets likely accept less rigid safety distances.

Control and target identification posts are established as necessary to exercise command and control of helicopters and aircraft in a designated air sector. The posts support the introduction of aviation into an

area of combat operations and also may direct ground strikes. The posts also accomplish direct coordination between ground-attack and fighter aircraft and ground air defense units. These posts are equipped with radar, communications, and automated equipment and may be ground- or air-based.

Control Versus Mass

According to the Soviets, strict centralized control is one of the "ecisive conditions for the successful conduct of combat operations" by aviation. Centralized control and mass are viewed as corollary principles, providing for the fullest exploitation of the mobility and maneuverability of aviation.

Aviation assets may be dispersed to avoid destruction by the enemy's nuclear or massive conventional fire strikes. However, through centralized control they are rapidly reconcentrated to deliver massive strikes against the enemy's main attack or in support of their own main attack. Centralized control also is alleged to enhance the planning and execution of surprise strikes on the enemy, to allow the maintenance of a strong air reserve, and to simplify coordination among aviation assets performing different missions in the same air space (e.g., air defense, ground support, reconnaissance).

In a rapidly changing combat situation, centralized control expedites the reallocation of aviation assets to accomplish important missions that suddenly arise during combat operations, such as destruction of enemy nuclear weapons, aviation, and reserves. At times, aviation assets that were not originally assigned ground support roles may be tasked to strike ground objectives. In contrast, it would seem that decentralized control of aviation assets, especially attack helicopters, is desired when combat operations are conducted on separate, disconnected axes. In such cases, combined arms commanders control and employ allocated aviation assets according to the needs of their maneuver forces.

Reconnaissance and Targeting

The principal method for gathering target intelligence is air reconnaissance. The *front* commander's staff prepares an overall reconnaissance plan that details tasks for tactical aviation assets. Tactical aviation reconnaissance focuses on the tactical and operational depths of the enemy, although targets at strategic depths also may be assigned.

Air reconnaissance is conducted to determine the enemy's intentions and collect intelligence for planning air and ground operations. There are four major categories of targets for air reconnaissance:

- Nuclear weapon systems and storage depots.
- Active and potential enemy airfields.
- Defensive positions and systems (air defense, command and control centers, electronic warfare centers).
- Enemy reserves, supply depots, and approach routes (particularly key intersections and bridges).

Aircraft crews on any mission are expected to immediately report observed enemy activity. Primary responsibility for air reconnaissance is borne by dedicated reconnaissance regiments. These regiments have specially equipped reconnaissance aircraft. Airborne electronic intelligence collectors also are available from aviation assets.

Perishable target intelligence data is transmitted by radio from the aircraft to ground command posts. Greater effort is being made to develop and improve methods for secure transmission of reports from the aircraft to data collection and processing centers. The processing of data from an air reconnaissance mission takes 2 to 8 hours, although procedures for interpreting reconnaissance data are being modernized to speed up this process.

In training exercises, the Soviets have shown some reservations about employing armed reconnaissance flights on battlefield and rear area interdiction missions ("free hunting" flights) until air superiority is established. Armed reconnaissance efforts would be directed toward disrupting the enemy's resupply operations and troop movements through the immediate exploitation of reconnaissance data (by a flight of a reconnaissance aircraft and two to four attack aircraft). Targets for interdiction missions are nuclear storage areas, enemy airfields, troop reserves, and command and control centers. Targets may be located up to 480 kilometers behind the front lines. Interdiction of enemy efforts to deploy and concentrate his forces against a rapid and highly mobile attacking force is considered particularly effective when the enemy lacks in-depth reserves and relies on moving forces laterally to blunt offensive operations.

The classification (characteristics and configuration) and location of targets are the bases for planning strikes). Targets are classified as single, multiple, line, or area. (See examples in the upper chart at right.)

Mission Execution

Air strikes in direct support of ground maneuver formations are primarily preplanned, with some on-call. The combined arms commander identifies the

targets, times, and desired damage for air strikes. The aviation commander determines the force, size, ordnance, and attack technique that will accomplish the strike mission.

Preplanned strikes are planned in great detail and integrated with other forms of fire support. Large scale maps and, in some cases, terrain models are used to familiarize pilots with targets, to plan approach and departure routes, and to develop attack techniques. Attack variations are developed and practiced to provide pilots with a ready response to changes in the situation.

The plan for preplanned strikes normally covers the first 1 to 2 hours of combat operations, but may cover a period of up to 24 hours in a static situation. The plan specifies the targets, strike force, time, location, attack technique and ordnance, communication codes, and approach and departure routes.

A portion of available air assets is held in readiness to execute immediate missions against unexpected targets. On-call strikes are made against predesignated targets, with the timing of strikes left to the discretion of maneuver force commanders. Aircraft and helicopters designated for on-call missions can be airborne in holding areas or on the ground at forward airfields.

The Soviets recognize three levels of combat readiness for fighter-bomber aircraft and crews, which are described in the lower chart below. These categories are probably also applicable to other types of ground-attack aviation assets. Aircraft in categories one and two respond to on-call missions.

Classification of Air Strike Targets

CLASSIFICATION	EXAMPLE	ATTACK TECHNIQUE
SINGLE (OR POINT)	Rocket launcher, tank or armored vehicle, parked aircraft, or helicopter. Radar firing point, observation point, or bunker.	Single aircraft using low-level or dive delivery of ordnance. ARM employed against radars. Single helicopter using ATGM or rockets.
MULTIPLE	Group of 10-20 single targets occupying an area of 1-1.5 km.	Attack by a small group (2-8) of aircraft or helicopters with the appropriate ordnance.
LINE	Tactical march column (usually 1 km or longer), train, runway.	Attack by a single aircraft or a small group along the long axis of the target. Helicopters attack column from the flank.
AREA	Dispersal or assembly areas of a battalion or larger unit, supply depot, large command and control center, forward airfield.	Massive and concentrated air strikes, delivered from various altitudes and directions.

Levels of Combat Readiness

CATEGORY	CREW AND AIRCRAFT POSITION	DURATION OF READINESS	TIME BEFORE TAKEOFF
ONE	Aircraft are fully serviced and armed. Combat crews are briefed on their mission and are in the aircraft ready to start engines. Ground personnel are assisting the combat crews.	1-2 hours	3-5 minutes
TWO	Aircraft are fully serviced and armed. Combat crews are briefed and are in the vicinity of aircraft ready to take off within a specified short period of time after receiving a mission order.	2-4 hours	15 minutes
THREE	Aircraft are refueled and serviced. Cannons are loaded. External systems (bombs, rockets, missiles, fuel tanks, etc.) are not loaded. Combat crews are known, but briefing on air and ground situation is given before takeoff.	2-4 days	1-2 hours

The Soviets prefer to use helicopters for immediate, time-sensitive strikes close to friendly forces. The reduced logistic requirements of combat helicopters, compared to those of fixed-wing aircraft, very often allow deployment close to the main battle area which enhances their ability to respond to on-call missions. The Soviets indicate that helicopters have other advantages over high-performance aircraft, such as the ability to concentrate and maneuver undetected for a strike and the enhanced capability of helicopter pilots to evaluate more rapidly and exactly the battlefield conditions. The Soviets, concerned for the vulnerability of helicopters to high-performance fighters, prefer to employ them in ground support only to the range of their air defense umbrella.

Conversely, fixed-wing aircraft are employed more frequently in strikes on previously reconnoitered, fixed or semifixed targets, in the immediate rear, or at greater depths. The vulnerability of high-performance aircraft to ground-based air defenses when executing ground attacks necessitates a low-altitude, high-speed target approach and minimum time in the target area. Making such an approach, the pilot has only 3 to 6 seconds to identify his target and, after attacking his target, should clear the target area within 10 seconds.

The Soviets emphasize the importance of deception and surprise in paralyzing hostile antiaircraft defenses. Aircraft approach the target area at the lowest permissible altitude given weather and terrain restrictions. Ideally, the approach altitude over enemy territory is 50 to 100 meters. Radio transmission is reduced to a minimum or prohibited entirely. Detected gaps in enemy radar coverage are exploited, and decoy flights in advance of attacking aircraft can be used to distract defending antiaircraft systems. If more than one pass is necessary to destroy the target, attacking flights approach the target from different directions to minimize antiaircraft effectiveness or approach from the direction of bright sunlight to minimize visual detection and recognition. Electronic countermeasures play a large role in neutralizing air defenses.

As long as modern antiaircraft defense relies on radioelectronic equipment, neutralizing its operation through interference is considered by the Soviets to be a major way to reduce aircraft losses. Soviet aircraft possess radioelectronic jamming equipment, which they believe will help them overcome the enemy antiaircraft defenses. The Soviets also expect their aircraft losses would be reduced due to the destruction of enemy antiaircraft defense weapons by fire delivered by the ground troops. The ground force radiotechnical facilities can also create interference in enemy systems of control.

SUPPORT IN THE OFFENSE

Besides the air operation at the onset of theater-level hostilities, Soviet doctrine calls for air support of ground forces in offensive operations. The Soviets recognize four stages of air support within an offensive operation: support for movement forward, air preparation, air support, and air accompaniment, which correspond to the phases of the fire support plan. The major difference between the phases is their time of deployment, although there are some differences in targeting, command, and aircraft.

Support for movement forward is to protect units as they move up from assembly areas.

Air preparation takes place prior to the onset of a ground offensive, across a specified frontage. It can be simultaneous with the preparation fire of both the artillery and missile units and requires close, detailed coordination with these forces with regard to targeting and timing. Air strikes in the preparation phase generally extend no farther than the enemy's immediate operational depth (i.e., enemy corps rear area). Depending on the combat situation, the duration of an air preparation can be from 10 minutes to over an hour. The targets are those that conventional artillery and missiles cannot destroy because of their distance, mobility, or "hardening." The plan for the preparation phase specifies in detail the targets, strike aircraft, time, location, attack technique and ordnance, and approach and departure rates. In special situations, such as amphibious assaults, long-range aviation and/or naval aviation may participate in air preparation attacks.

Air support begins after ground forces start an offensive. Its targets are at tactical and immediate depths and include enemy nuclear weapons, command and control systems, and enemy reserves. The majority of air strikes are preplanned, but immediate air attack missions against centers of resistance are made at the request of ground force commanders within the limitations of their allocated resources. The air support phase closely follows the operational plan prepared before the onset of the offensive and is an extension of the strong artillery fires associated with Soviet offensive operations. As in the air preparation stage, the targets generally are those beyond the destruction capabilities of artillery and missiles.

Air accompaniment occurs as Soviet ground forces penetrate deeply into enemy defenses. The specific point at which air accompaniment begins is not clear, but it is during the advanced stage of offensive operations when the progress of the ground forces has outstripped the prepared fire support plan, and reassessment and reallocation of air resources are necessary. After allocating air resources before an offensive, the

front commander plays little further direct role in the conduct of air support unless large reallocations are required. However, in the air accompaniment phase, the role of the *front* commander is again emphasized, indicating the probability of significant reallocations of air resources supporting maneuver forces to adjust to the developments in the combat situation.

Air cover for airborne and airmobile operations is a type of air accompaniment mission which might take place concurrently with the preparation phase or support phase over the FEBA.

Both fixed-wing aircraft and combat helicopters are used in the three stages of air support for offensive ground operations. The increasing numbers of combat helicopters deployed enable them to play a greater role in the support of ground forces freeing fixed-wing aircraft for missions against deeper targets such as nuclear weapon depots and airfields.

In a meeting engagement, air support assets, especially attack helicopters, screen and support Soviet units as they maneuver into position. Also, air strikes are employed against enemy columns moving forward to reinforce engaged units. Soviet exercise scenarios frequently have attack helicopters employed in flanking attacks against reinforcing or counterattacking enemy armor columns.

In a pursuit, air support assets (either high-performance aircraft or helicopters) attack withdrawing enemy units through armed reconnaissance and in ambushes along withdrawal routes. Combat helicopters also can be assigned to support forward detachments outside the range of artillery fire.

SUPPORT IN THE DEFENSE

In the defense, air fire support is integrated into the overall defensive fire plan. The air fire support plan extends to the immediate operational depth of the enemy and seeks to disrupt his attack plans.

Several variations of the air fire support plan are developed in detail. Variations of the plan take into account the anticipated actions of the enemy and his most probable avenues of approach. An aviation counterpreparation is planned for each variation. The objective of the counterpreparation is to launch a powerful, surprise, concentrated strike of short duration to preempt the enemy's plan. The targets of the counterpreparation are—

- Nuclear warheads and delivery systems.
- Artillery in firing positions.
- Aviation on airfields.
- Armored or mechanized forces preparing to attack.
- Major command and control points, headquarters, and communications centers.
- River-crossing sites and equipment, ammunition, and fuel dumps.

Variations of the plan also provide for air strikes against attacking forces that are out of range of artillery and tactical rockets, and concentrated fire by all fire support weapons or forces that have reached, or penetrated, forward defensive positions.

Helicopters with ATGMs are employed to counterattack armored or mechanized forces. The helicopter force seeks routes that allow it to approach the flank of the enemy force undetected. If terrain variations do not provide adequate concealment for the force, smoke may be employed to conceal its approach.

During withdrawal, helicopters support rear guard units by attacking advancing enemy units from ambush and by laying minefields.

TRENDS

The Soviets are attempting to resolve problems about the provision of more reliable and continuous air fire support to ground forces. In this respect, their efforts seem to be concentrated in two areas: improved accuracy of munitions delivery and improved air and ground interaction.

The Soviets have already introduced a new generation of helicopter-mounted ATGMs with greater standoff range and accuracy. They also have in production or development precision-guided munitions (PGM), "smart bombs" which are similar to those deployed by US forces. A new air-to-surface missile, the AS-X, is expected to have a range of approximately 40 kilometers with electro-optical guidance and low altitude (150 meters) firing capability.

Soviet discussion on organizational forms of aviation has centered on improved interaction with maneuver formations, including organization of support for army-level operations, organization of bomber "strike groups," and development of improved night air reconnaissance and fire support of ground maneuver units.

Subordination of some aviation assets to the army commander has been accepted in practice, as the Soviets frequently refer to "army aviation." The issue now appears to be the optimum composition and strength of the army-level aviation force. Discussion focuses on a mixed air regiment of reconnaissance and liaison aircraft and up to a division-sized unit of ground attack aviation.

Considerable interest also has been expressed in forming aviation "strike groups." The strike groups

would be capable of conducting independent operations against key targets at operational and strategic depths of the enemy, both during and subsequent to the conduct of an air operation. It also would deliver strikes in support of ground maneuver formations at operational and tactical depths. A strike group would be two to three air divisions strong, would consist primarily of fighter-bomber and bomber (probably BACKFIRE and BADGER) aircraft, and would be subordinate directly to the Soviet High Command.

A third area of expressed interest is the improvement of nighttime aerial reconnaissance and ordnance delivery in support of ground maneuver formations. Despite heavy emphasis on night combat, the Soviets recognize limitations in their capability to maintain continuity of air support at night. They see a need for improved target designation and mutual identification procedures between air and ground units at night, even to the extent of forming special helicopter units for night combat.

As new equipment is introduced and when organizational modification is accomplished, Soviet aviation will be able to provide increased support to combined arms forces. Improved accuracy of ordnance delivery, greater flexibility in employment, and increased responsiveness to combined arms commanders will enhance air-ground coordination.

CHAPTER 13

SMOKE

The Soviets employ smoke extensively on the battlefield. It probably will be used every time the situation permits. The Soviets distinguish between toxic and nontoxic smokes in their doctrinal literature. This distinction drives their planning on when they should mask. They intend to force the enemy to use his chemical protective systems which will generally lower his effectiveness.

A number of different agents may be used together. For instance, chloride mixtures produce a particulary effective liquid agent. Liquid chloride agents are composed primarily of titanium, silicon, or tin tetrachlorides. Smokes, such as the S-4 compound, (chlorosulfonic acid, sulfur trioxide, and sulfuric acid) may be seeded with particulates to block portions of the electromagnetic spectrum more fully. The vast quantities of white phosphorus on the battlefield suggest also that random mixtures of this agent will combine with other obscurants, both man-made and natural.

Soviet forces are well equipped for the use of smoke. Their munitions and equipment include—

- Smoke grenades.
- Smoke barrels, drums, and pots.
- Spray smoke generators.
- Mortar and artillery smoke rounds.
- Combat vehicle engine exhaust smoke systems.

Smoke delivery systems are plentiful, as are smoke-filled artillery projectiles, smoke bombs, spray tanks, and generator systems. Conventional wisdom, stemming from Soviet open writings, holds that some 7 to 10% of all artillery units of fire are smoke rounds, mostly white phosphorus (WP) and more recently plasticized white phosphorus (PWP).

The Soviets maintain that when firing is done from a position covered with smoke at targets outside the smoke, effectiveness decreases approximately 10 times. When only the targets are concealed by smoke, effectiveness decreases four times.

In recognition of the need to counter target acquisition and guidance systems operating in the IR and microwave regions of the electromagnetic spectrum, the Soviets are developing smokes and aerosols capable of attenuating such radiation.

TYPES OF SMOKE SCREENS

The Soviets recognize three basic types of smoke screens: blinding, camouflaging, and decoy. Each type is classified as being frontal, oblique, or flank in nature, depending on the placement of the screen. Smoke screens are either stationary or mobile depending on prevailing winds and the dispensing means used. Each basic type is intended to serve a different tactical purpose, but all may be employed simultaneously.

The intent of *blinding smoke screens* is to blind enemy gunners, observation posts, and target acquisition systems and to restrict the enemy's ability to engage Soviet forces effectively. The blinding smoke screen normally is produced by the Soviet S-4 mixture and WP and/or PWP. The casualty effects and collateral damage produced by WP and PWP are significantly greater than those of other agents. These smokes probably are preferred for use against enemy positions. The WP and PWP can be delivered by rocket launchers, artillery, mortars and fixed-wing aircraft or helicopters. S-4 probably is delivered by spray tanks mounted on aircraft.

Blinding smoke rounds are included in the artillery preparation for an attack and in fires in support of the attack. Likely targets are enemy defensive positions, rear assembly areas, counterattacking forces, fire support locations, and subsequent objectives.

The screening properties of a blinding smoke screen, coupled with the dust, HE combustion effects, and incendiary effects of phosphorus, create an environment in which fear and confusion are added to the measured effectiveness of the smoke.

The purpose of *camouflage smoke* is to provide freedom of movement for units, to conceal the location of units and the nature and direction of an attack, to provide protection against the thermal radiation of nuclear explosions, and to degrade night-vision sights. The camouflage smoke screen is used on or to the front of friendly troops. These screens normally are employed up to the point where forces deploy to the attack formation. The number, size, and location of camouflage smoke screens vary depending on terrain, weather, and the tactics conducted. Soviet writings describe a battalion-level exercise in which four separate camouflage screens were established to cover the battalion's deployment to company columns, movement toward the forward edge of the battle area (FEBA), and final deployment to attack formation, a distance of approximately 3 kilometers.

Camouflage smoke screens normally are established by using a combination of smoke barrels, smokepots, combat vehicles with smoke-generating systems, decontamination vehicles, vehicles mounting smoke-generating devices, and/or aircraft. The smoke generators of armored or TMS-65 decontamination

vehicles establish a smoke screen very quickly. However, they can be easily detected, so normally they are used only when cover is available or well behind friendly lines. Smoke-generating vehicles start at the center of the line to be smoked and travel in opposite directions along that line at approximately 15 kmph. Two vehicles are sufficient to lay a smoke screen long enough to cover a battalion advancing to the attack. For larger smoke screens, the line is divided into segments, with two vehicles assigned to each segment. The Soviets state that camouflage smoke screens should cover an area at least five times the width of the attacking unit's frontage.

The Soviets are concerned with the threat of enemy helicopter-mounted ATGM systems. Consequently, Soviet doctrine calls for advancing forces to move as close behind the smoke screen as possible. The higher the smoke screen, the higher a helicopter must go to observe troop movement behind the smoke screen and the more vulnerable the helicopter is to ground-based air defense weapons. The TMS-65, which can lay a smoke screen approximately 400 meters high, is an excellent dispenser for this purpose. There is considerable observation-free maneuver space behind a screen of this height. Conversely, smokepots provide a 5- to 10-meter high screen which screens against ground observation, but leaves the force vulnerable to helicopters "hugging the deck" and "popping up" to shoot.

Soviet literature and training indicate that the Soviets do not consider "neutral" smokes to be harmful to personnel or equipment given the relatively limited exposure expected during the movement to attack. Consequently, Soviet troops rarely wear protective clothing when operating in camouflage smoke.

A *decoy screen* is established to deceive an enemy as to the actual location of friendly forces and a probable direction of attack. The site and location of decoy screens depends upon the type of combat action, time available, terrain, and weather conditions. An example of the use of decoy screens is a river crossing in which several possible crossing sites are screened simultaneously. If the enemy fires into the decoy screen, black smoke devices and fires will be ignited to simulate burning vehicles or equipment. Other "disinformation" which should be expected includes speakers emitting sounds of tanks operating.

METEOROLOGICAL INFLUENCES ON SMOKE

Local meteorological conditions impact greatly on the employment of smoke. The command and control of troops maneuvering in smoke is extremely difficult even when the use of smoke is planned and commanders have had an opportunity to conduct reconnaissance and to prepare their troops. When meteorological conditions are not considered, smoke unexpectedly covering friendly forces can lead to disorientation, loss of command and control, and tactical disaster. Careful analysis of meteorological conditions in the planning process cannot be overemphasized. The meteorological conditions that most affect the employment of smoke are wind, lower-atmosphere stability, temperature, relative humidity, and precipitation.

Wind direction is usually specified according to its relation to the line of the FEBA and is classified as *head, tail, oblique, or flank.* A wind that blows at an angle of 60° to 90° to the FEBA is considered either a head or tail wind, depending on whether it is blowing from one's FEBA to that of the enemy (tail) or vice versa (head). An oblique wind blows across the FEBA at an angle of 30° to 60°. A flank wind blows parallel to, or not more than 30° from, the FEBA. A tail wind is highly favorable when forces are attempting to establish a blinding smoke screen.

Wind speed data help to predict the drift rate and life span of a smoke screen and the quantity of smoke agent required. The Soviets classify wind speed as being favorable, moderate, or unfavorable as shown below.

Wind Effects on Smoke Operations

WIND SPEED	CONDITION
0-1.5 meters/sec	Unfavorable
1.5-3.0 meters/sec	Moderate
3.0-5.0 meters/sec	Favorable
5.0-8.0 meters/sec	Moderate
Greater than 8.0 meters/sec	Unfavorable

Under favorable conditions, the smoke cloud is disrupted very little, its life span is optimum, and the quantity of smoke agent required is minimal. Under moderate conditions, a relatively large quantity of smoke agent is required; however, the life span of the cloud still permits tactical use. A high density of smoke may be achieved under moderate wind speeds. If the wind direction changes frequently, there is a danger of ineffective dispersal. With unfavorable wind speeds, the smoke cloud disperses too rapidly or not at all.

Three conditions of atmospheric stability are recognized: *stable, neutral, and unstable.* Stable conditions exist when the lower layers of the air are

cooler than the upper layers. This usually occurs at night and in the early morning when there is a cloudless sky. During this time, intermixing of air in the atmosphere is very limited, and the smoke tends to drift along the earth's surface. Neutral conditions exist when the air temperature is the same at the earth's surface as it is at the upper layers. This usually occurs when there is cloud formation and the wind speed exceeds 2 to 3 meters per second. This condition favors the employment of smoke. In unstable conditions, the lower layers are warmer than the upper layers, thus causing an intensive intermixing of the air by vertical air movements. These conditions normally occur on cloudless days, and/or when wind speeds exceed 12 to 14 meters per second. Under these conditions a smoke cloud quickly disperses.

Heavy rain is unfavorable for smoke. Falling raindrops wash the smoke out of the air, and lead to the accelerated dispersion of a smoke cloud.

Favorable meteorological conditions for employing smoke occur when a wind is stable in direction with a speed of 3 to 5 meters per second and a stable or neutral atmospheric condition exists. Average conditions for using smoke include a wind speed of 1.5 to 3

Munition Expenditure Norms for Producing a 1-km Smoke Screen for 15 Minutes

WEAPON	WIND DIRECTION					
	HEAD OR TAIL		OBLIQUE (45°)		FLANK	
	Number of tubes	Number of rounds	Number of tubes	Number of rounds	Number of tubes	Number of rounds
82-mm mortar	12	1000	8-12	750	8	500
120-mm mortar	8	300	8	220	4	150
122-mm howitzer	8	300	8	220	4	150

NOTES:
1. The wind speed is assumed to be 3 to 5 meters per second.
2. If the wind speed is 6 to 7 meters per second, the ammunition consumption should be multiplied by 1.5.
3. An artillery battery of 6 pieces, regardless of the caliber of its weapon, can produce a smoke screen—
   - over a 500- to 700-meter front if the wind is a crosswind.
   - over a 150- to 200-meter front if the wind is a head or tail wind.

   If a front exceeds these dimensions, it must be divided among the batteries.
4. When there is a layer of snow over 20 cm in depth, the ammunition consumption should be multiplied by a factor of 1.5 to 2.

Munition Expenditure Norms for Producing a 120- to 200-Meter Smoke Screen for 15 Minutes

WEAPON	REQUIRED ROUNDS WITH HEAD WINDS		REQUIRED ROUNDS WITH FLANKING WINDS			
	Up to 5 meters per second	More than 5 meters per second	Up to 2 meters per second	3-5 meters per second	6-7 meters per second	More than 7 meters per second
82-mm mortar	120	200	25	40	60	90
120-mm mortar or 122-mm howitzer	40	70	12	18	25	40

meters per second or 5 to 8 meters per second with neutral atmospheric conditions. Unfavorable conditions consist of wind speeds of less than 1.5 or greater than 8 meters per second, gusty winds, winds that are unstable in direction, strong unstable atmospheric conditions, and heavy rain.

An analysis of worldwide environmental conditions shows that certain areas are better suited for smoke use than others. For example, in Western Europe the winds are normally stable, the relative humidity is normally high, and the average number of cloud-free days is low (approximately 36 to 38 per year). As a result, Western Europe provides highly favorable conditions for the use of smoke. The Middle East, especially the desert regions, is not very favorable because of the low relative humidity.

Smokepots also may be used to establish a smoke screen. To estimate the number of pots required to maintain a smoke screen for a particular operation, the Soviets use the following formula:

$$N = \frac{AT}{LWD}$$

WHERE:

N = number of smokepots required
A = area of smoke screen (square meters)
T = time to maintain smoke screen (minutes)
L = length of impenetrable smoke screen from one pot (meters)
W = width of smoke cloud at end of screen from one pot (meters)
D = duration of smoke formation from one pot (minutes)

For safety, **N** is increased by 10 percent to 15 percent. Additionally, as the amount required is affected by available light and meteorological conditions, the required number may be reduced by 30 percent to 40 percent at night and increased by up to 50 percent if the wind is gusty or has a velocity greater than 5 meters per second.

Soviet guidelines for the use of smoke are—

- Before and during an attack, smoke should be placed on enemy firing positions and observation points. Artillery, mortar, and aircraft are to be the primary means of dissemination.
- Artillery, aircraft, smokepots, and barrels are to be used to create screening smoke throughout the tactical depth of the enemy's defense and to screen the flanks of attacking units.
- Screening smoke of 2 to 3 hours' duration should be placed along a wide front to cover units conducting river-crossing operations. Screens are to be placed on both sides of the river; floating pots and barrels also may be placed in the river. Decoy screens are employed at one or more other likely crossing sites in an attempt to deceive the enemy.
- Important locations and possible targets such as troop concentrations, crossing sites, bridges, railroad junctions, and unloading areas are to be screened as the situation dictates.
- Avenues of approach to these locations also should be screened, with particular attention being given to eliminating reference points that could aid enemy aviation in targeting the screened location.
- Reliable communications and continuous coordination between units using smoke and forward air warning and air defense posts is essential.
- Maneuver forces should be covered by smoke screens set down on a broad front.
- Camouflage, blinding, and decoy smoke screens should be used to conceal the direction and time of attack and to minimize losses.
- Smoke may be used to mark targets for friendly aircraft and for signaling purposes.
- Smoke should be used to screen logistics routes and activities such as the repair and evacuation of tanks, evacuation of casualties, etc., that are within range of enemy fire and observation.
- Smoke should be used to cover the movements of guns into firing positions and from position to position.
- Smoke should be used to screen the activities of engineer units when clearing minefields and to mark passages through engineer barriers.

Soviet smoke doctrine and capabilities are impressive. However, very little training has been observed, except for limited driving drills. When vehicle drivers cannot see to drive, and young commanders cannot see to command, it must be expected that there will be confusion, and perhaps a hesitancy to use their doctrine as fully as they would like.

CHAPTER 14

ENGINEER SUPPORT

The Soviets recognize that execution of combined arms operations requires extensive use of engineer support. This support is influenced by the requirement to maintain high speed offensive operations, by the widely-dispersed nature of combined arms operations, and by the increased lethality of conventional and nuclear weapons.

ORGANIZATION

There are two types of Soviet engineers: sapper, or combat engineers found at regiment and division, and more skilled engineers organized and trained for specific missions. The latter type of engineer normally is organic to army and *front.*

Engineer troops are assigned down through regimental level in all Soviet maneuver divisions, and platoons are sometimes detailed to battalions for specific operations.

At army level, engineer units could include a ponton bridge regiment, an assault crossing battalion, and a general engineer regiment or brigade. At *front* level, there might be a general engineer regiment or brigade, along with specialized ponton bridge regiments and assault crossing battalions.

Motorized rifle or tank divisions have an engineer battalion with various vehicle-launched bridges, ponton bridges, and heavy amphibious ferries, along with trucks, and mine-clearing, construction, and demolition equipment. The engineer battalions in tank divisions have a larger number of heavy amphibious ferries to support the divisions' armored vehicles. Airborne divisions have an engineer battalion of lesser strength, with no heavy vehicle-launched bridging equipment, ferries, or ponton bridge sections.

The engineer battalion at division level is capable of performing the following missions—

- Provide engineer staff planning for organic and attached engineer troops.
- Construct, repair, and maintain roads, bridges, fords, and culverts.
- Support stream and river crossings with necessary equipment.
- Coordinate organic and attached engineer troops in water crossings.
- Assist in emplacement of obstacles and mines. Provide technical assistance in preparation of field fortifications.
- Conduct engineer reconnaissance and develop engineer intelligence.
- Provide personnel and equipment for water purification and supply of potable water.
- Assist in assault of fortified positions by furnishing sappers.

Most of the tasks described above are done by sappers. Engineers carry out more specialized work such as the construction and operation of floating bridges and ferries.

The engineer company in a motorized rifle regiment of a motorized rifle or tank division is organized into a mine warfare platoon, a technical (construction) platoon, and a bridge platoon. The company has several APCs, vehicle-launched bridges, and assorted mine-clearing equipment.

From his senior commanders, the battalion commander receives engineer support to enable his unit to cross natural and man-made obstacles, and to construct defensive positions and barriers.

The Soviets may assign motorized rifle or other troops to perform engineer tasks when necessary. Troops of all arms and services are trained to perform some engineer tasks such as building weapons emplacements and trenches, emplacing and clearing mines by hand, and camouflaging weapons and equipment.

Motorized rifle and tank regiments, however, rely heavily on their organic engineer company to—

- Provide limited mine warfare capability.
- Execute route reconnaissance and route opening.
- Support crossing of water and dry gaps with truck-launched and tank-launched bridging.
- Provide earth-moving capability for road work and entrenchments.
- Execute camouflage and demolitions.

The Soviet concept of engineer support includes the attachment of support units from higher levels to those front line units in contact with the enemy from assets of senior commanders. Engineer unit tactical employment does not always follow strict organizational lines. Tactical employment of combat engineer, engineer reconnaissance, and road and bridge subunits generally involves the formation of one or more of the following functional groupings:

- Mobile Obstacle Detachment (MOD).
- Movement Support Detachment (MSD).
- Engineer reconnaissance patrol.

Each engineer unit organic to a maneuver unit is commanded by a chief of engineer services (CES). The CES is responsible for the organization of engineer support, maintenance and use of engineer equipment,

and combat readiness of the engineer units. He concentrates engineer efforts to support a main offensive effort or critical defense sector. At each level, the CES coordinates with the chief of engineer services at the next higher level.

The CES at regimental level is usually a major. He participates fully in the staff, and coordinates with the other chiefs of services, and the chief of staff. He contributes to the reconnaissance plan, the combat order, river crossing, and NBC defense plans. In accordance with the commander's decisions, he plans engineer support, the disposition of engineer subunits, and the use of combat units assigned to engineer tasks.

ENGINEER SUPPORT IN THE OFFENSE

In the offense, the primary mission of the engineers is to assist in maintaining a high rate of advance. Emphasis is on clearing and maintaining routes for the advance of maneuver elements. This includes the clearance or removal of mines and other obstacles, crossing of water obstacles, assisting in flank protection and protection against counterattacks. Engineer reconnaissance, performed independently or with other reconnaissance, plays a significant role in achieving a high rate of advance. Basic engineer tasks also include the support of logistic operations in the rear area.

Engineer Reconnaissance

Engineers are included in all reconnaissance elements of tank and motorized rifle units. The mission of engineer reconnaissance is to report on the condition of the routes of advance for the main body. The unit performing the route reconnaissance must determine the following:

- Obstacles to be overcome.
- Engineer equipment required.
- Conditions of crossing sites.
- Location and quantity of materials which can be used to improve the march route.
- Nature of the terrain and the location of areas that do not afford natural concealment.

Engineer reconnaissance provides information about assembly areas, detours around obstacles, and warning of minefields and craters. Reconnaissance of water obstacles is done to find fording sites and suitable entry and exit points for amphibious combat vehicles. Detailed reconnaissance is required for bridge and ferry sites.

When the situation warrants, engineer reconnaissance patrols are formed for specific missions. An engineer reconnaissance patrol may consist of one or two BRDM scout cars or APCs. It is usually commanded by an officer. Reconnaissance of tank fording sites require divers and a tracked amphibian with river reconnaissance devices. An engineer reconnaissance patrol is equipped with portable mine detectors and route marking flags and may have a vehicle-mounted mine detector for mounted mine reconnaissance of roads and trails.

Movement Support

Information gathered as a result of engineer reconnaissance is used to determine the selection of march routes requiring the least amount of engineering preparation and the employment of engineer assets for route clearing.

The movement support function includes all engineer activities which facilitate the movement of maneuver forces. A movement support detachment (MSD) is task organized from division or regimental engineer assets based on the mission and the availability of assets. It can be from platoon to company strength and is equipped with route and mine clearance vehicles and equipment. The MSD can fill craters, clear mines, prepare bypasses from major obstructions, and identify contaminated areas. It normally does not include bridging equipment with the exception of that needed for its own movement. Maneuver regiments have their own truck- and tank-launched bridges and normally do not require bridging support from the MSD.

During marches, the MSDs travel in advance of the main body clearing obstructions reported by division reconnaissance elements. The division engineer battalion can form two or three MSDs. These detachments are employed on main routes, and, where possible, under the protection of an advance guard or forward security element. On other routes, the leading regiments provide MSDs from their organic engineer resources. A common MSD at this level might consist of an engineer platoon with one or two dozers and up to three tanks fitted with dozer blades. MSDs are protected by up to a platoon of infantry or tanks and should be accompanied by chemical reconnaissance personnel.

Minefield Breaching

The normal Soviet method of breaching minefields during an assault or rapid advance is to employ mine plows fitted to the lead tanks. Although engineers reconnoiter the minefield, the initial breaching is not

Movement Support Detachment

VARIANT 1

1 RECONNAISSANCE AND BARRICADE DESTRUCTION GROUP	2 ROAD-BRIDGE GROUP	3 ROUTE MARKING GROUP
• Tank w/Mine Plow	• Truck-launched Scissors Bridge	• Motorized Rifle Platoon, APC-Mounted, w/Marking Equipment
• Combat Engineer Squad, APC-Mounted - Explosives - Mine Detectors - Mine Probes	• Tracked Dozer	
• Bridge-laying Vehicle	• Carriers for Bridge and Road Personnel	
• Chemical Dosimetrists	• Truck-mounted Crane	
	• Motorized Rifle Platoon (-1 Squad)	

VARIANT 2

1 RECONNAISSANCE AND BARRICADE DESTRUCTION GROUP	ROAD-BRIDGE GROUP		4 ROUTE MARKING GROUP AND RESERVE
	2 ROAD GROUP	3 BRIDGE GROUP	
• Tank w/Mine Plow	• Tractor Dozer	• Combat Engineer Squad	• Motorized Rifle Squad
• Combat Engineer Squad, APC-Mounted - Explosives - Mine Detectors - Mine Probes	• 1/2 Engr Squad w/Explosives	• Truck-launched Scissors Bridge • Carriers for Bridge and Road Personnel	• 1/2 Engr Squad w/Marking Equipment
• Bridge-laying Tank		• Truck-mounted Crane	
• Chemical Dosimetrists		• Motorized Rifle Platoon (-1 Squad)	

primarily an engineer task. KMT-4 and KMT-6 plows normally are employed on the scale of one per platoon of three to four tanks. Engineers assist in the fitting of these and plow-roller combinations (KMT-5s) which are commonly used for minefield reconnaissance. The Soviets estimate clearing speeds of about 10 kmph for plow-fitted tanks and up to 22 kmph for roller-fitted tanks. Combat vehicles other than those on a tank

chassis have to wait until the full width of the lane is cleared. This is often done by tanks with plows or rollers towing a line charge across the minefield behind them and then setting off the charge.

The Soviets employ a mine-clearing device mounted on the BTR-50PK APC (two to each divisional engineer battalion). This piece of equipment fires an explosive hose (line charge) across the minefield which is then detonated. It clears a lane about 180 meters long by 6 to 8 meters wide. This equipment is particularly useful during an assault river crossing when there are minefields on the far bank and amphibious APCs may have to operate initially in the bridgehead without tank support.

Another mine-clearing device is the BDT explosive line charge. It consists of three separate linear charges, a nose section, and a detonator box. Each linear charge may be assembled to any desired length by connecting 2-meter sections together with threaded collars. The light, sheet metal, 5-cm-diameter, tubular sections are filled with cast TNT explosive at 9 kg per linear meter. The BDT is versatile, in that it may be used as a single, double, or triple charge. The forward end section is fitted with a roller to facilitate insertion of the charge into a minefield. The BDT is assembled in a rear area and towed by a tank to the edge of the minefield; then it is pushed into the minefield and fired. The triple line charge clears a 6-meter wide path along the entire length of the charge. A squad of men can assemble a 500-meter long triple charge in 1 to 1.5 hours.

Bangalore torpedoes also are used. Sections, 2-meters in length and carrying 6 kilograms of explosive, are connected by collars. The depth of clearance of a path 1 to 2 meters wide is limited only by the manageable weight that can be manually pushed into the minefield.

The number of lanes to be cleared depends on the terrain and the number of columns in the assault echelon. For a leading battalion in a main attack, six to eight lanes may be required, one for each assaulting platoon. In supporting attacks as few as two may be sufficient. However, an average of four to six can be expected with at least two developed into permanent lanes 6 to 8 meters wide for the passage of artillery and logistic vehicles. Engineer sappers mark minefield lanes and provide traffic control through the minefield. The routes leading from a start line to each lane are marked with red triangular metal flags and black and white tapes. Illuminating markers may be used at night. Routes through friendly minefields are marked by signs of various shapes placed not less than 20 meters apart on both sides of the route. If possible, they are positioned so as not to be visible from enemy positions.

Mine Laying

Minefield laying is most rapidly accomplished using armored tracked minelayers (three to each divisional engineer battalion). Hand emplacement and towed minelayers are also utilized. Special teams called mobile obstacle detachments (MODs) are formed from regimental and division engineers assets. Their mission is the rapid laying of mines in the most likely enemy avenues for attacks or counterattacks. MODs are positioned on the flanks of a march formation to be prepared for rapid deployment and normally are in close proximity of the antitank reserve. An MOD consists of up to three armored tracked minelayers or truck-towed minelaying trailers and two to three vehicles carrying mines for resupply. Both the tracked minelayers and the minelaying trailers dispense mines at predetermined spacings of 4 or 5.5 meters. Minelaying helicopters, which dispense mines from a chute while flying at a height of about 5 meters, may also be employed. Antitank minefield density is usually from 750 to 1000 mines per kilometer. Using the division's three armored tracked minelayers, a three-row antitank minefield up to 1,000 meters in length can be surface laid in half an hour on suitable ground. In the same time, a regimental MOD (three minelaying trailers) might lay some 500 meters of minefield.

Assault River Crossings

The Soviets stress that water obstacles should be crossed from the march to preclude major halts in the offense. Doctrine includes crossing these obstacles at multiple points along a broad front to overwhelm enemy defenses. Doctrine also calls for river crossings to be made at night; however, Soviet units rarely train in night river crossings. Smoke is used extensively to mask assault crossings conducted during daylight hours.

Engineer river crossing capability is found at the regimental engineer company organic to motorized rifle and tank regiments, the division engineer battalion, and special engineer battalions and regiments at *front* and army level. A more detailed discussion of Soviet river crossings can be found in *FM 100-2-2.*

ENGINEER SUPPORT IN THE DEFENSE

Engineer support for the preparation of defensive positions consists of the following actions:

- Engineer reconnaissance of the enemy and terrain.
- Preparation of fortifications for protection of weapons, personnel, and equipment.
- Construction of obstacles (coordinated with the fire plan and natural obstacles).

- Construction of routes for blocking and counterattacking forces.
- Support of camouflage and deception measures.
- Provision of water supply.

Engineer tasks during the defense are implementation of obstacle plans, particularly antitank obstacles, to block enemy penetrations. A mobile obstacle detachment (MOD) may join antitank reserves to counter enemy tank threats. Another task for the MOD is repair of existing routes and creation of new routes to support the maneuver of forces. A third task is reacting to the effects of nuclear strikes by the enemy (fire fighting, structure repair, removal of essential debris).

In first echelon units, engineer fortification of defensive areas is done preferably at night, or under conditions of reduced visibility. Mechanized digging capability is used for trenches, revetments, and shelters in those areas not subject to direct enemy observation or fire.

During the combined arms commander's personal reconnaissance, he makes final decisions about the disposition of units, strongpoints, fire support systems, the obstacle and barrier system, and the type of engineer preparation required. He considers the cover and concealment (camouflage) potential of the terrain, and devotes special attention to determining those areas where he can employ earth-moving machines and prefabricated fortification constructions.

Engineer troops assist in reconnaissance and preparation of the defense by determining the protective and camouflage features of the terrain and aiding in selection of positions for command posts and subunit strongpoints. Engineers also determine road and bridge conditions in the defensive area, availability of local materials for construction of positions, and the status of the water supply. Engineer observation posts usually are manned by two or three engineers with a periscope range finder and possibly photographic equipment. The posts are located approximately 2 to 3 kilometers apart along the front. They monitor the conditions of roads, barriers, bridges, and the water supply as well as assist in monitoring radiation and contamination levels in the defensive area.

To some extent fortification, shelters, and vehicle revetments are constructed by all troops. The engineers are charged with constructing the more complex fortifications. In addition, engineer troops normally construct barrier systems which are coordinated with the overall system of fire. The first priority in the barrier system is given to antitank obstacles. Additional maneuver routes for the rapid and concealed employment of counterattack or blocking forces are prepared by engineers, to include mine clearance within the defensive area, if required.

As an example, in establishing a prepared defense, personnel of a motorized rifle battalion in the first echelon may construct the basic trenches and company and platoon strongpoints. Basic revetments for tanks, APCs, command observation posts, antitank guided missiles (ATGMs), and mortars may be constructed by engineers. Engineers employing digging machines may construct fortifications for the battalion's second echelon—covered shelters and bunkers, communications trenches, and alternate ATGM and mortar positions. Primary, temporary, and alternate artillery firing positions; ammunition bunkers; personnel shelters; and prime mover revetments are prepared by the gun crews. Obstacles are created on approaches into the defensive position, in front of artillery and air defense firing positions, in the undefended gaps between strongpoints, and on flanks. Antipersonnel minefields are emplaced forward of the FEBA to give added protection to antitank minefields or to protect gaps between defensive strongpoints. Existing roads are cleared, improved, and marked. Maneuver routes to the front and flanks and supply-evacuation routes are prepared, usually by the engineer elements of the senior combined arms commander. Dummy positions may be constructed. Effectiveness of all camouflage measures is checked periodically by aerial observation. Once established by engineers, water supply points usually are operated and monitored by motorized rifle troops.

The Soviets contend that a tank, protected by a revetment, is significantly more effective in defense than an attacking enemy tank, and is superior in its direct fire capability and camouflage. Therefore, particular attention is given to masking and protecting aspects of the terrain and to preparing revetments with cleared fields of fire. Tank defensive positions in subunit strongpoints are prepared with primary and alternate positions (about 200 meters apart) for all-around defense. The primary revetments are constructed first, while alternate positions and ammunition storage areas follow in work priority.

CAMOUFLAGE AND WATER SUPPLY

The Soviets believe that camouflage measures are important in all combat actions. Under all conditions, camouflage is an individual as well as an organizational responsibility. Individual soldiers and crew members are expected to make use of natural vegetation to camouflage equipment and positions. Engineer tasks

are characterized by efforts to minimize the necessity for camouflage by proper site selection and reconnaissance of the natural camouflaging and concealing properties of the terrain. Camouflage nets may be used in place of natural foliage. Smoke also is employed to conceal movement and to deceive the enemy.

It is in the defense that camouflage is applied in the greatest detail. Here, the intent of camouflage is to compel enemy reconnaissance to report incorrect data on troop deployment through concealment and deception. Soviet guidelines state that camouflage should be convincing in its realism, that it be applied constantly and consistently through the whole area, and that it be diverse. In organizing for camouflage, allowances must be made for proper use of the masking effect of terrain features, for the season and time of day, as well as the weather and other visibility factors. Troops are dispersed also and their dispersal areas frequently relocated, but not at the expense of either security or control. All troops are made aware of factors that adversely affect camouflage, such as light, sound, motion, incorrect coloration or contrast, shape, skylining, and trackage.

In all combat operations, engineers are responsible for supplying water and for determining its suitability for human consumption. Where NBC weapons have been employed, medical service and chemical defense troops assist in evaluating the water.

CHAPTER 15

ELECTRONIC WARFARE

SOVIET EW CAPABILITIES

For years the Soviets have recognized the importance of electronic warfare (EW) and have made a major investment in electronic counter-countermeasures (ECCM), as well as lethal and nonlethal countermeasures. Soviet writings on EW are included under broader topics such as security, command and control, reconnaissance, air defense, and camouflage. This treatment of electronic warfare in the context of routine operations indicates that the Soviets consider EW to be integral to all combat actions.

Technical advancements in both electronic warfare support measures (ESM) and electronic countermeasures (ECM) have been noted in all Soviet forces. Ground forces continue to introduce new jammers, as well as a new series of improved signals intelligence (SIGINT) vehicles. The air forces have numerous aircraft devoted to EW as escort and standoff jammer platforms. Also since 1979, there has been increased emphasis on Soviet offensive, penetrating air forces equipped with ECM and accompanied by dedicated EW aircraft. Strategic fixed jammers are located throughout the Soviet Union. Soviet writings on EW indicate a close parallel to US practices and capabilities:

- Communication and electronic reconnaissance (COMINT/ELINT)*—Employed for intelligence collection, to include targeting for artillery and air.
- Electronic countermeasures (ECM)*—Employed to neutralize enemy communications and electronics through jamming and deception.
- Electronic counter-countermeasures (ECCM)*—ECCM capabilities are achieved through strict enforcement of signal security, equipment redundancy, alternate subsystems, system design, and operator skill.

Communications is the basic means to ensure troop control. Loss of communications is the loss of troop control, and the loss of troop control in battle invariably leads to defeat.

LTC L. Titov
Voyenny Vestnik No. 7, 1971

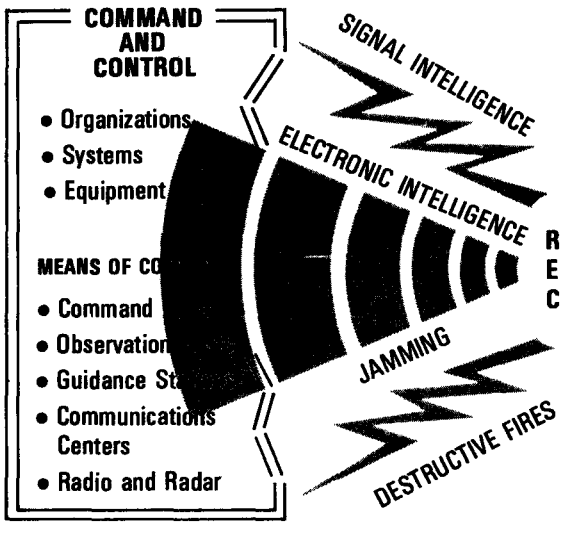
SOVIET RADIOELECTRONIC COMBAT (REC)

The Soviets have developed their electronic warfare capabilities into an integrated system called radioelectronic combat (REC). REC doctrine adds a new dimension to the US view of electronic warfare. REC combines signals intelligence, direction finding, intensive jamming, deception, and destructive fires to attack enemy organizations and systems through their means of control. The purpose of REC is to limit, delay, or nullify the enemy's use of his command and control systems, while protecting Soviet systems by electronic counter-countermeasures. An estimated goal of the system is to destroy or to disrupt a majority of the enemy's command, control, and weapon system communications, either by jamming or by destructive fires.

The Soviets recognize the impossibility of completely depriving enemy forces of their sources of control for extended periods of time. Accordingly, Soviet REC planners have established mathematical models to estimate "critical times" in command and control procedures. This critical time is defined as the sum of the times required to complete a sequence of steps in control:

- Collection and reporting of data.
- Evaluation and decision.
- Issuance of orders and preparation.
- Completion of action.

Soviet Radioelectronic Combat (REC)



*US Terminology.

Against this background, the aim of radioelectronic combat is to disrupt the enemy's critical time phasing to the extent that perishable information (on which decisions and orders are based) becomes obsolete.

TARGET PRIORITIES

Communication control points are assigned a priority according to their expected relative impact on the battle. They are selected with the intention of eliminating them by either physical destruction or by jamming. Although REC target priorities are dependent on the command level and may be altered as the tactical situation develops, they generally are—

- Artillery, rocket, and air force units that possess nuclear projectiles or missiles and their associated control system.
- Command posts, observation posts, communications centers, and radar stations.
- Field artillery, tactical air force, and air defense units limited to conventional firepower.
- Reserve forces and logistics centers.
- Point targets that may jeopardize advancing Soviet forces, e.g., dug-in tanks, antitank guided missile emplacements, bunkers, and direct fire guns.

INTELLIGENCE REQUIREMENTS

Essential to the success of Soviet REC objectives is the collection of accurate and timely intelligence. Soviet forces require knowledge of the enemy's electronic order of battle with details of operational procedures, equipment types, emission characteristics, and locations. Some technical intelligence information concerning US electronic equipment is obtained from open source material, such as technical manuals and field manuals. These manuals may include ways in which communications and electronics equipment is employed, transmitter power output, kinds of antennas normally used with different equipment, and frequency bandwidth. Other vital information is obtained by the reconnaissance, target acquisition, and intelligence assets available at the various command levels. Locating targets of specific interest to the REC effort is accomplished best through the use of electronic intercept and direction finding (DF) measures.

ELECTRONIC INTERCEPT AND DIRECTION FINDING

Radio intercept and radio direction finding are the primary means of gathering enemy intelligence through electronic means. Radio intercept is the ability to monitor and understand message content, while radio direction finding is designed to locate transmitting stations. As demonstrated by Egyptian use of Soviet equipment during the October 1973 Middle East War, the Soviets have an extensive intercept capability for radio transmissions and radar emissions. Intercept units are moved forward immediately behind leading regiments and have the capability to intercept enemy transmissions within the following distances from the FEBA:

- Artillery ground radar - about 25 km
- VHF - about 40 km
- HF ground waves - about 80 km
- HF skywave - unlimited

These ranges are greatly extended when airborne intercept is employed.

Soviet ground based and airborne intercept equipment generally lacks the technical sophistication of the latest Western equipment, but is simple, rugged, and easy to maintain.

The Soviet DF capability is equivalent to that for intercept. Various types of mobile directional antenna systems can be used in a radio direction finding (RDF) role. Forward area mobile elements include a VHF tactical radio direction finder with an Adcock antenna, as well as the POLE DISH radar direction finder. Tactical FM radios operating on low power can be picked up by Soviet RDF units at distances in excess of 10 kilometers and high power signals detected at distances up to 40 kilometers. RDF operational accuracies are usually within ± 3.5 degrees.

Direction finding is used—

- To provide approximate locations of electronic emitters.
- To provide locations which, when applied with SIGINT, terrain analysis, or other means, can be refined to a target area of sufficient accuracy for artillery fires.
- To develop a "picture" of the battlefield which reveals the disposition and possible intentions of enemy units.
- To provide adequate locations for firing on most radars and jammers.

Because of the length of transmission, the peculiarity of their signal, and power output, jammers can be easily located and identified as targets for attack by suppressive fires. Ground radars, due to signal characteristics, may be located with greater precision than radio emitters, often within 50 to 200 meters. Information from DF resources is evaluated quickly, but usually requires further confirmation by other sources. DF targets within conventional artillery range, which are extremely perishable and considered to be a

serious threat, are given priority and engaged immediately.

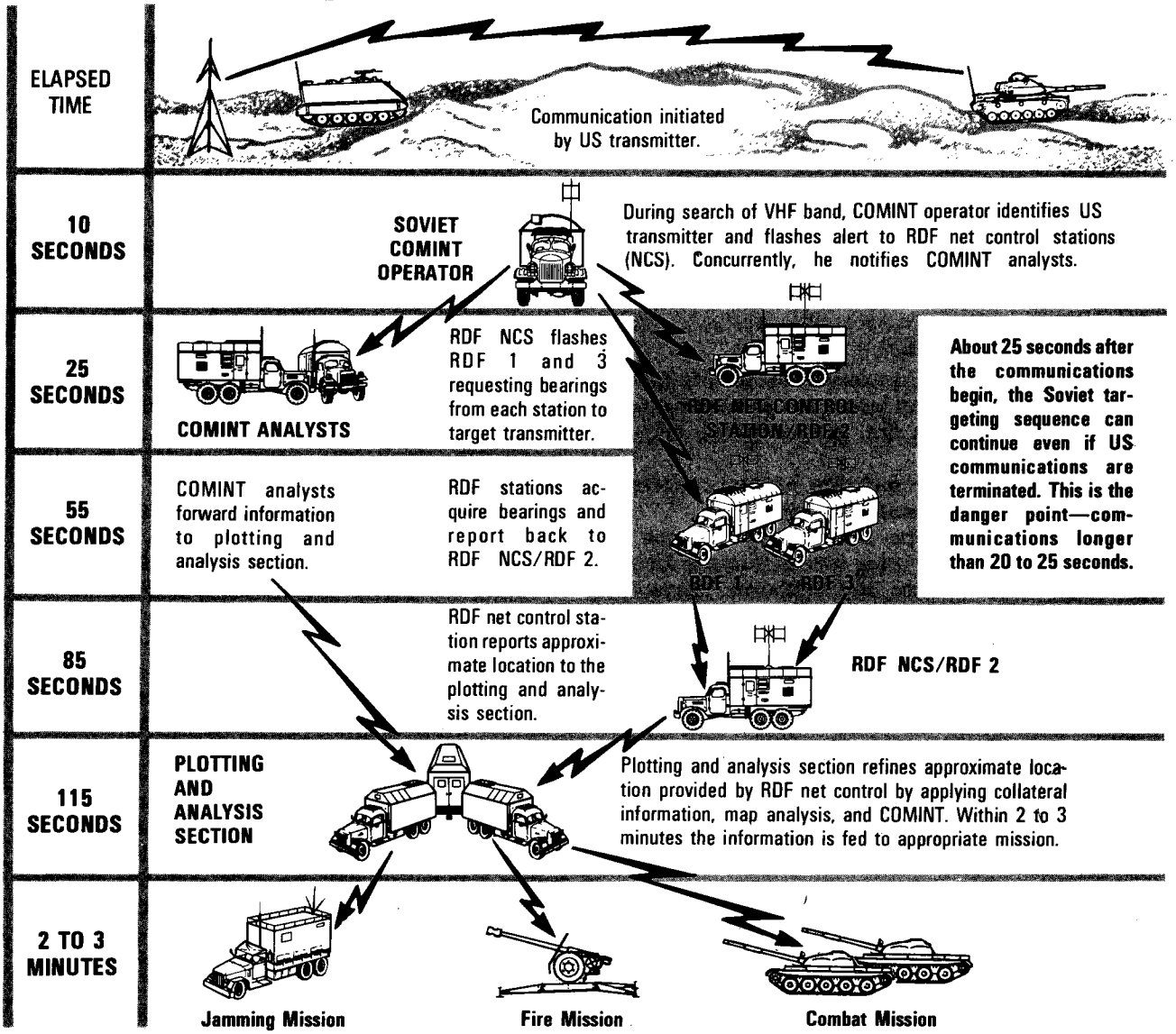
The chart below illustrates Soviet ground-based electronic intercept and DF capabilities. About 25 seconds after the communications begin, the enemy targeting sequence can continue even if friendly communications cease. Accordingly, the danger point is reached when radio transmissions exceed 20 to 25 seconds.

Besides the targets located by direction finding, it is expected that others will be developed due to the enemy's lax signal security and poor electronic counter-countermeasures.

ELECTRONIC COUNTERMEASURES (ECM)

REC doctrine establishes a requirement to jam at critical times enemy command and control and weapon system communications when they cannot be destroyed by firepower. Available equipment includes the R-330A and R-834 radio jammers. Additionally,

Intercept and Direction Finding



newer and more technically-advanced jammers are being deployed by Soviet ground forces. Radar jammers include the BRICK series of noise jammers.

Soviet technical writings concerning ECM have dealt with these missions:

- Jamming in support of air defense operations, suppressing radar bombing equipment, radio navigation equipment, and radio control links for air-to-surface missiles (ASMs) and surface-to-surface missiles (SSMs).
- Jamming in support of ground operations, suppressing nuclear delivery systems, radars, radio control links for ASMs and SSMs, command posts, and communications centers.

The principal means of jamming discussed in Soviet writings are—

- Radar jamming by using barrage and spot noise, pulse, chaff, and decoys.
- Electronic jamming of command guidance systems—using pulse and simulation techniques.
- Radio noise jamming of AM and FM signals.

Jamming targets will include the tactical air control system, which uses HF radios for immediate air requests, VHF-FM radios to link forward air controllers, and UHF radio links for strike control.

USE OF FIREPOWER

Integral to Soviet REC doctrine is the use of physical destruction means. Soviet forces can physically attack in three ways: indirect fire, ground attack, and air attack.

- *Indirect fire.* This includes artillery, mortars, rockets, and surface-to-surface missiles.
- *Ground attack.* The Soviets may attempt to destroy C^3 elements by using special purpose forces, agent-saboteurs, airborne and heliborne forces, or other elements operating behind the front lines.
- *Air attack.* The Soviets may decide to attack with high performance aircraft or attack helicopters. Aircraft may use conventional ordnance (bombs, cluster bomb units (CBUs), rockets, cannon, or machine gun fire) or precision-guided munitions (smart bombs and ASMs).

Ground forces also may be used to plant a transmitter within the enemy perimeter for beacon bombing.

GROUND BASED EW CAPABILITIES

Electronic warfare units are found at various command levels from *front* down to division level. A typical *front* could include at least a radio and radar intercept regiment, a radio intercept regiment, an air defense jamming regiment, and a radio jamming regiment. EW units available to the army commander normally would be of battalion size. Within the division, the EW capability is centered in the divisional reconnaissance battalion. The battalion can conduct limited intercept and direction finding, as well as traditional ground reconnaissance.

Based on Soviet historical experiences and their current capabilities, it appears that the destructive aspects of REC are emphasized near the FEBA, probably within the division. More elaborate applications of REC, such as large deception plans, would be prepared at army level, or higher, with subordinate divisions implementing them.

Front, army, and divisional artillery units also have an organic target acquisition capability. Generally, these units contain—

- Surveillance and weapon locating radars.
- Radar intercept and direction finding sets.
- Sound ranging equipment with a range of about 14 km from the FEBA.
- Flash spotting observation posts.

Some knowledge of Soviet ground-based EW capabilities has been derived from the Arab use of Soviet EW equipment during the October 1973 Middle East war. It is unlikely that the systems observed represented the full array of EW systems available to Soviet forces, nor were they the most modern. The EW means used by the Arabs against Israeli ground forces included—

- SIGINT monitoring of the clear text radio communications.
- Direction finding of radio transmissions for targeting.
- Barrage jamming to disrupt command channels.
- Intrusion to give false directions and orders.

AIRBORNE EW CAPABILITIES

Aviation supporting *front* operations includes support squadrons with aircraft equipped to conduct electronic warfare missions. These units can conduct electronic reconnaissance missions and ECM against radar, electronic guidance, and communications systems. The most common air ECM operations are spot or barrage jamming and dispensing chaff directed against enemy air defense early warning and fire control radars. *Frontal* aviation bombing operations will be protected or camouflaged by aircraft using ECM in either a stand-off or escort role. Jamming equipment, with an effective range up to 200 kilometers and covering frequencies used by NATO air

defense radars, is installed in these ECM aircraft. They also may eject chaff to achieve jamming, deception, and camouflage. Individual aircraft may carry self-screening jammers and chaff dispensers.

Various Soviet aircraft have variants that are dedicated to EW activities. Included are modified versions of the AN-12 CUB used for ECM and electronic intelligence (ELINT) collection, the COOT-A ECM or ELINT variant of the IL-18 transport which supposedly carries a side-looking airborne radar (SLAR), and fighter variants such as the MiG-21 FISHBED H with a centerline pod, and the MiG-25 FOXBAT, which carries five cameras and is believed to have a SLAR capability. There are also ECM versions of the Yak-28 BREWER (E-model) fixed-wing aircraft and the Mi-4 HOUND helicopter (C-model). The Mi-4 contains multiple antennas projecting from the front and rear of the cabin, and, on each side, communication jammers.

Airborne electronic reconnaissance platforms provide a much improved capability to intercept radio and radar signals more frequently and at greater distances than ground-based systems. These airborne electronic reconnaissace platforms are aimed at the detection and location of enemy battlefield surveillance radars, command posts, communication centers, and tactical nuclear delivery systems. They also are used in standoff or escort jamming roles.

Long-range EW aircraft include the BEAR D, BISON C, BADGER D, and BADGER F variants.

SEABORNE EW CAPABILITIES

From all indications, the Soviets are engaged in updating and expanding their naval EW capabilities. The auxiliary intelligence gatherers (AGI) perform the more overt functions and are the best known of all Soviet intelligence gathering activities. These vessels, many of which are basically trawlers, follow major NATO exercises. The AGI have increased in number from 4 in 1963 to 58 in 1981, and are used for collection of communication and electronic intelligence. Additionally, the Soviet fleet includes over 160 survey and research vessels, some of which could have electronic reconnaissance missions.

Naval aircraft are employed in long-range reconnaissance and ocean surveillance, with some aircraft equipped to provide midcourse target data for antiship missiles launched "over the horizon" from surface ships, submarines, and other aircraft. Reconnaissance aircraft now in use include about 50 of the larger Tu-95/BEAR D turbo-prop planes, about 100 twin-jet Tu-16/BADGER aircraft, and Tu-22/BLINDER jet aircraft that have a supersonic speed.

ELECTRONIC COUNTER-COUNTERMEASURES (ECCM)

The Soviet objective for ECCM is the satisfactory operation of their electronic equipment in the face of enemy disruption. Thus physical protection of the equipment is included, as well as other practices beyond the scope of western ECCM. Modern ECCM features have been designed into the newer air defense equipments used in the Yom Kippur War. However, the greatest emphasis has been on organizational and individual techniques that can be applied in the field.

Organizational ECCM Techniques

Physical destruction of the enemy jammer is an important ECCM technique. More traditional techniques involve changing operating schedules and call-signs, alternate use of different radars, skip-echelon communications, redundant communications links, and the use of high ground between radio-relay terminals and enemy territory. Operator ECCM training and discipline also are organizational functions carried out at all echelons. For example, air defense radar operators receive regular training in both chaff and active jamming environments.

Individual ECCM Techniques

Operators are drilled thoroughly in the use of their equipment and in built-in ECCM features. In many cases, operator initiative is expected to overcome the lack of complete ECCM circuitry. Operators can change power, modulation, and antenna direction as appropriate. Operators may initiate frequency changes, but obviously must remain under organizational control. Soviet military writings continually stress communications security (COMSEC) and operator awareness of equipment capabilities and limitations.

Antiradar Camouflage

The Soviets conceal military equipment against detection by ground, airborne, and shipborne radars by a technique called "antiradar camouflage." Depending on the radar visibility of the objects to be camouflaged, antiradar camouflaging is achieved by creating false targets or by blending into the terrain background those objects that might serve for orientation. Equipment may be concealed behind local features or by making use of the camouflaging properties of the ground relief. The Soviets use natural cover, timber, brush wood, metallic nets, and corner reflectors for radar camouflage. Mock-ups of military equipment also can be used as antiradar reflectors.

The Arab air defense system during the 1973 Middle East War provided an insight into the equipment and ECCM techniques of the Soviet forces. Their use displayed—

- *Signal security.* The radars of the SAM and AAA, which were moved forward to cover the initial assault, were kept silent until after the initiation of the assault.
- *Frequency spread.* Each of the diverse air defense systems operated within separate radar frequency bands, so that no one jamming system could operate simultaneously against all.
- *Frequency diversity.* Tracking and guidance radars were able to change frequencies to overcome jamming.
- *Multiple and interchangeable missile guidance systems.* Some systems worked on pulsed radar, others on continuous wave. Some of the radar tracking systems also possessed optical tracking for continued operations in a high ECM environment. Other systems used infrared homing.
- *Mobility.* All tactical air defense systems were extremely mobile and capable of quick change of position after firing or being spotted by reconnaissance.

SATELLITES

About 70 percent of Soviet space systems serve a purely military role. Soviet military satellites perform a wide variety of reconnaissance and collection missions. Recent reconnaissance satellites have improved intelligence collection processing capabilities. ELINT satellites can lock onto intercepted signals to provide information concerning target location. Large area radar surveillance satellites have also been identified.

CHAPTER 16

NUCLEAR, BIOLOGICAL, AND CHEMICAL WARFARE

The Soviets anticipate the use of nuclear, biological, and chemical (NBC) weapons, particularly nuclear and chemical. The Soviets have developed and fielded a wide range of NBC detection and warning devices, individual and collective protective equipment, and decontamination equipment that facilitates the continuation of combat operations despite the presence of contaminants. *The Soviet ground forces' capability to protect themselves against NBC weapons and to operate in contaminated environments is unmatched by any other military force in the world.* Another factor illustrating the Soviets' overall preparedness for combat operations in an NBC environment is the extensive psychological conditioning that is combined with NBC training. The Soviet soldier is conditioned to regard the employment of NBC weapons as a real possibility in modern warfare. He is further conditioned to regard an NBC environment not as a disastrous situation, but one in which well-trained and skillful troops can survive and which they can use to their advantage.

The Soviets readily admit that casualties would be considerable in any future war involving the use of NBC weapons. However, they insist that the timely use of protective equipment, correct employment of reconnaissance assets, and expeditious decontamination procedures can significantly reduce a combat unit's vulnerability.

During the last decade, the Soviets have steadily improved their capability for waging theater nuclear and chemical warfare, while significantly improving their conventional fire support capabilities. This force modernization has introduced a degree of flexibility previously unavailable to Soviet combined arms commanders and created multiple options for the employment of nuclear and chemical weapons. Consequently, the Soviets have examined the possibility of waging a theater conflict at different levels, with or without nuclear weapons. They have developed what would seem to be a more balanced view toward the complementary employment of nuclear and nonnuclear fire support.

Confident that they can fight decisively with or without nuclear weapons, the Soviets now consider that a major conflict may be nonnuclear for at least an initial period and may remain nonnuclear for the duration of the conflict in certain "peripheral" theaters. Despite the potential for a sustained period of conventional or nonnuclear combat, a theater conflict will be conducted under a "nuclear-scared" posture.

The Soviets classify both nuclear and chemical weapons as "weapons of mass destruction" relative to troop protective measures, but consider chemical munitions to be "conventional" weapons when discussing employment doctrine.

NUCLEAR WEAPONS

The Soviets classify nuclear weapons according to yield or explosive power and type of burst. Nuclear weapons are considered very high in explosive power if their yield is over 500 kilotons, high if between 100 and 500, medium if between 15 and 100, and low if up to 15 kilotons. Types of burst that may be employed are air, ground (surface), underground, and underwater.

Soviet training materials present detailed descriptions of the destruction factors associated with nuclear explosions—the shock wave, thermal and light radiation, initial (penetrating) radiation, and residual radioactive contamination of the ground. The Soviets attribute the bulk of a nuclear weapon's destructiveness to its shock wave, although the actual distribution of energy depends largely on the type of burst employed. Following an atmospheric explosion, for example, 50 percent of the resultant energy is said to be released through the shock wave. Thermal and light radiation accounts for 35 percent of the energy for such a blast; initial radiation, 5 percent; and fallout, 10 percent for those weapons employed in the ground burst mode.

In measuring both initial radiation and fallout, the Soviets use *roentgen* (r) as the standard unit of measurement of radiation absorbed dose. The Soviets prefer to measure radiation dosage in roentgens rather than rads and do not specify time periods for total exposure doses when discussing the various degrees of radiation sickness. One roentgen (r) equals 0.88 rads.

They state that a single dose of up to 50 r in the course of 4 days or a continuous dose of up to 100 r over 10 days is not considered dangerous. Doses greater than 100 r are said to cause radiation sickness. First-degree radiation sickness occurs when a total dose of 100 to 200 r is absorbed. The latency period lasts from 2 to 3 weeks, and symptoms include lethargy, nausea, and intermittent fever. First-degree radiation sickness is curable. Second-degree radiation sickness is caused by a total exposure dose of 200 to 300 r. The latency periods lasts about 1 week, after which radiation induced symptoms appear. The symptoms are similar to those experienced with

first-degree radiation sickness but are more severe. Recovery takes about 2 months with good medical care. Third-degree radiation sickness is caused by a total exposure dose of 300 to 500 r. The latency period is only a few hours, and the symptoms are still more severe. With active medical treatment, recovery takes several months. A dose greater than 500 r is usually fatal. Radioactive contamination of an area, or fallout, is measured in roentgens per hour. According to the Soviets, an area is contaminated if 0.5 roentgens per hour or more is measured.

Besides the shock wave, thermal and light radiation, initial radiation, and fallout produced by nuclear weapons, the Soviets mention secondary effects such as fires and electromagnetic interference. Electromagnetic interference, or electromagnetic pulse (EMP), originates with the release of nuclear radiation. It is a pulse of short duration that covers most of the usable frequency band to a range greater than the other effects of the detonation. EMP can burn out unprotected electronic equipment such as data processing and intelligence equipment, weapons systems, and radars.

NUCLEAR OPERATIONS

Planning

Although the opening stages of an offensive are likely to be conventional, planning focuses on the necessity to counter enemy employment of nuclear weapons, to maintain the initiative and momentum of the offensive, and to maintain fire superiority over the enemy (preempt his strike). The fire plans for divisions and higher levels include contingency plans for nuclear strikes. At all stages nuclear delivery means will be surveyed in and target-ready to make a strike. The decision to initiate tactical nuclear warfare would be made at the highest level of government. The fire plan for the initial massive nuclear strike, as it would include strikes by the Strategic Rocket Forces (SRF), is probably developed at theater level and approved by the Supreme High Command. Employment authority for subsequent nuclear strikes probably is delegated to *front* and may be as low as army command level. The division chief of rocket troops and artillery (CRTA) submits recommendations for the subsequent employment of the division's nuclear and chemical weapons to the army commander for approval and integration into army and *front* fire support plans.

In deliberately planned operations, nuclear fires are planned in detail. In more mobile situations, as in meeting engagements, exploitation, and pursuit, some nuclear weapon systems are kept in high readiness to fire on targets of opportunity.

Soviet target analysts favor airbursts and use larger yields than their US counterparts. Strikes near the FEBA are to be followed up by maneuver forces as closely as safety and circumstances permit. Deep strikes may be exploited with the use of airborne troops.

Nuclear allocations vary with the strength of the enemy defense and the scheme of maneuver. A main attack probably receives the highest percentage of weapons; however, weapons also might be reserved for other large, important targets.

Targeting

Soviet nuclear delivery systems that threaten the European theater include intermediate-range ballistic missiles (IRBM) and medium-range ballistic missiles (MRBM) stationed in the Soviet Union. They also include aircraft from both strategic and *frontal* aviation, rockets and surface-to-surface missiles with ranges from 70 to 900 kilometers, and 203-mm howitzers and 240-mm mortars.

The following targets are considered suitable for employment of tactical nuclear strikes:

- Enemy nuclear-delivery means—air, artillery, missiles, and rockets. (These receive the highest priority.)
- Headquarters of division and higher levels.
- Prepared defensive positions.
- Reserves and troop concentrations.
- Supply installations, especially nuclear ammunition storage points.
- Communication centers.

Soviet targeting analysts work on the assumption of high reliability of nuclear delivery means. They usually rely on one device per target. If a target is considered to require more than one nuclear device, coverage will be overlapping.

The suitability of targets is determined by their priority category, missions, the current tactical situation, and the nuclear weapons available for use.

Offensive Employment

Once the decision to release nuclear weapons is made, their use is governed by two principles: mass and surprise. The initial nuclear strike will be accomplished suddenly, throughout the depth of the enemy's combat deployment, and in coordination with nonnuclear fires. Initial nuclear strike objectives are—

- To destroy the enemy's main combat formations and his command and control system.

- To destroy the enemy's nuclear weapons.
- To isolate the battlefield.
- To breach the enemy's main line of defense and define the main axes of attack.

Nuclear fires are employed to support the main attack while other fire support means support secondary or supporting attacks. The enemy's forward defenses are targeted and destroyed rather than avoided and bypassed. Nuclear strikes in effect are the main attack. These strikes then are exploited by a high-speed air and ground offensive.

Subsequent nuclear strikes are integrated with the maneuver and fire support plans and employed to re-initiate an offensive that has been slowed or stopped by organized enemy resistance. Nuclear strikes also may be used to eliminate the threat of a counterattack and to clear resistance from the opposite bank in a river crossing. In pursuit, nuclear strikes are planned on "choke points" when retreating enemy forces present lucrative targets.

Defensive Employment

If an enemy offensive can be severely degraded by the impact of nuclear weapons, the defender may gain the opportunity to switch quickly to an offensive role. This drastic change in force correlation is sought when nuclear weapons are employed on the defense. Primary uses are—

- Destruction of enemy nuclear delivery means.
- Destruction of main attacking groups.
- Counterpreparations.
- Elimination of penetrations.
- Support of counterattacks.
- Denial of areas to the enemy by use of surface bursts.

Radiologically contaminated barriers produced by surface or subsurface bursts may be used to prohibit or slow the advancing enemy and to canalize large elements into pockets to become a nuclear target.

BIOLOGICAL WEAPONS

Since the summer of 1979, information has been obtained from a variety of sources that presents evidence of an inadvertent release of anthrax bacteria from a highly secured military installation in Sverdlovsk. The available information and US technical analysis point strongly to biological research and development activities that exceed those normally expected for biological warfare protection purposes.

If biological weapons are employed, they would probably be targeted against rear area objectives such as food supplies, water sources, troop concentrations, convoys, and urban and rural population centers rather than against front line forces. The Soviets realize that if biological agents are employed against such targets, they could seriously disrupt and degrade mobilization plans as well as the subsequent conduct of a war. Some biological agents are extremely persistent, retaining their capabilities to infect for days, weeks, or longer. The prolonged incubation period makes it difficult to track down the initial location and circumstances of contamination.

Biological weapons consist of pathogenic microbes and the toxins caused by micro-organisms, both of which are intended to incapacitate or kill people or animals and destroy plants, food supplies, or material. Almost a thousand different types of pathogenic micro-organisms are known to exist; however, not all of them are adaptable for use in warfare as biological weapons. Micro-organisms are classified as bacteria, viruses, rickettsia, or fungi. Bacteria, which are resistant to both low temperatures and freezing, cause diseases such as bubonic plague, cholera, and anthrax. Viruses are responsible for smallpox, variants of encephalitis, and yellow fever. Rickettsia, bacteria-like micro-organisms which are found living as parasites in arthropods, can cause certain human diseases such as rocky mountain spotted fever. Fungi are similar to bacteria in that both exist in plants; however, fungi have a more highly developed structure. Toxins are a class of highly active poisons produced as a naturally occurring by-product of some living organisms, or through a chemical production method. A few well-known diseases that are produced by toxins include botulism, tetanus, and diphtheria. Toxins can retain their potency for many weeks and, in some cases, for months. Available delivery means mentioned by the Soviets include rockets, artillery shells, mines, air-dropped packets, aircraft sprayers, saboteurs, and infected insects and rodents.

There is a degree of danger inherent in the use of some pathogenic microbes because of the difficulty or near impossibility involved in controlling an epidemic caused by them. Some pathogenic microbes and toxins derived from microbes are not contagious, while other microbes cannot be transmitted without a suitable vector.

CHEMICAL WEAPONS

The armed forces of the Soviet Union are better equipped, structured, and trained than any other military force in the world to conduct offensive and defensive chemical warfare. Although the Soviets are aware

of their overwhelming advantage, they continue to steadily improve their chemical warfare capabilities. Much of their training revolves around the use of lethal agents. Reports from Afghanistan and Southeast Asia show the Soviet's willingness to use chemical agents when it is to their advantage.

The basic Soviet principle of chemical warfare is to achieve surprise. They would use massive quantities of chemical agents against unprotected troops or equipment. Chemical agents also may be used to restrict the use of terrain.

Initially, the use of chemical weapons may be subject to the same level of decision as nuclear weapons, but they are likely to be used more freely once the initial authority for employment has been given. In a nuclear war, chemical weapons are used to complement nuclear weapons. However, they may be used in a nonnuclear environment against an enemy whose chemical defenses are weak or where their use would be particularly advantageous.

Airfields, nuclear storage sites, and nuclear delivery systems are targets for chemical attacks since such targets can be neutralized without the necessity of pinpoint strikes. Also, contamination of key points along rear area lines of communication can seriously disrupt rear area resupply and reinforcement, while simultaneously keeping those points intact for subsequent use by attacking Soviet forces.

In the offense, other likely chemical targets are—

- Troops occupying defensive positions across the front of a Soviet attack. The troops may be neutralized by nonpersistent agents delivered by multiple rocket launchers.
- Nuclear delivery systems, troop concentration areas, headquarters, and artillery positions. All types of chemical agents delivered by field guns, multiple rocket launchers, missiles, and aircraft are the most likely.
- Bypassed pockets of resistance which pose a threat to the flanks or rear of attacking forces. Defending troops can be attacked directly or their movement restricted by contamination.

In defense, persistent chemical agents are employed to deny the enemy use of certain terrain and to canalize attacking forces. Chemical agents are employed against an attacking force to impede effective command and control and to destroy the momentum of the attack by causing the attacking troops to adopt protective measures.

The Soviets have a variety of systems capable of chemical delivery. They include aircraft, multiple rocket launchers, artillery, mines, rockets, and missiles.

The Soviets classify chemical agents according to the effect they have on the organism. They identify six major types: nerve, blood, blister, choking, psychochemical, and irritant. Nerve agents are fast-acting chemical agents. Practically odorless and colorless, they attack the body's nervous system causing convulsions and eventually death. A fatal dose consists of only 2 to 10 milligrams. Nerve agents are further classified as either G or V agents. G agents were developed in Germany before and during World War II and include the agents Tabun, Sarin, and Soman. The V agents are quicker acting and more persistent than the G agents. Blood agents cause death by blocking the oxygen transferral mechanisms in the body. A common blood agent is hydrogen cyanide.

Blister agents, such as mustard (H) or lewisite (L) and combinations of the two compounds, can disable or kill after contact with the skin, or after being inhaled into the lungs or ingested. Contact with the skin can cause painful blisters or blindness after eye contact. These agents are especially lethal if inhaled. Incapacitants disrupt a victim's mental and physical capabilities. Consciousness may not be lost, however, and the effects usually wear off without leaving permanent physical injuries. Irritants, also known as riot-control agents, cause a strong burning sensation in the eyes, mouth, skin, and respiratory tract. The effects of these agents, the best known being tear gas, are also temporary. Victims recover completely without having any serious aftereffects.

Chemical agents are categorized as persistent or nonpersistent. Persistent agents, such as V-agents, some G-agents, and the blister agent mustard, can retain their disabling or lethal characteristics depending on environmental conditions for days, weeks, and in some cases, years. Nonpersistent agents generally last a shorter period of time, depending on weather conditions. Soviet military writings indicate that nonpersistent agents would be used across the front of a Soviet attack before a combat engagement. Persistent agents would be used deep within the enemy's rear and along troop flanks to protect advancing units.

The Soviets possess antidotes for protection from agents of potential adversaries as well as their own. They have developed and fielded an antidote for soman, which is an agent they possess but is not in the US inventory.

Chemical agents believed to be in the Soviet inventory include the agents described in the chart at right. Stockpiles of chemical agents greatly exceed those available to the West and are sufficient to sustain large scale use.

Chemical Agents Reportedly Stockiled by the Soviet Union

TYPE OF AGENT	SYMBOL/NAME	SYMPTOMS IN MAN	EFFECTS ON MAN	RATE OF ACTION
NERVE	G Series GB/Sarin GD/Soman (VR 55)	Difficult breathing, sweating, drooling, nausea, vomiting convulsions, and dim vision.	At low concentrations, incapicitates; kills if inhaled or absorbed through the skin.	Very rapid by inhalation; slower through skin.
	V Agent		Incapacitates; kills if contaminated skin is not decontaminated rapidly.	Delayed through skin; more rapid through eyes.
BLOOD	AC/Hydrogen cyanide	Rapid breathing, convulsions, coma, and death.	Incapacitates; kills if high concentration is inhaled.	Rapid.
BLISTER	HD/Mustard HN/Nitrogen Mustard L/Lewisite HL/Mustard and Lewisite CX/Phosgene Oxime	Mustard; nitrogen mustard-no early symptoms. Lewisite and mustard-searing of eyes and stinging of skin. Phosgene oxime-powerful irritation of eyes, nose and skin.	Blisters skin and respiratory tract; can cause temporary blindness. Some agents sting and form wheals on skin.	Blister delayed hours to days; eye effects more rapid. Mustard lewisite and phosgene oxime very rapid.
INCAPACITANT	None known, but a sleep inducer has been reported in Afghanistan.	Slowing of mental and physical activity; disorientation and sleep.	Temporarily incapacitates.	Unknown.
IRRITANT	DA/Diphenylchloroarsine DM/Adamsite CN/Choroacetophenone CS/O-Chlorobenzalmalononitrile PS/Chloropicrin	Causes tears, irritates skin and respiratory tract.	Incapacitates, nonlethal.	Very rapid.

SOVIET PROTECTION AND WARNING EQUIPMENT

Most Soviet NBC equipment is dependable and apparently in good supply. Some of it, as in the case of the electrically fired warning flag dispenser, is rather ingenious. However, other pieces of protective NBC equipment have drawbacks. One deficiency is the low level of human engineering that is applied to their general design. An additional shortcoming is the potential effect of weather on chemical and radiation reconnaissance instruments, which are calibrated for optimal use within rather narrow ranges of temperature (-40 degrees to +40 degrees C) and humidity (50 to 80 percent). In winter, the instruments are warmed up chemically or electrically before use. The present inventory of NBC equipment includes, but is not limited to, detection and warning devices, individual and collective protective equipment, and decontamination equipment. For information concerning individual items of equipment, see FM 100-2-3.

CHEMICAL DEFENSE TROOPS

There are approximately 80,000 to 100,000 fulltime NBC defense personnel in the Soviet ground forces. Although they are designated "chemical defense troops," their responsibilities also include protection against the effects of nuclear and biological weapons. Like engineer and signal forces, chemical defense troops are considered a vital element of combat support. Although all troop branches of the ground forces can be assigned to perform certain NBC protection-related activities, chemical defense troops are tasked with primary responsibility for insuring that combat units function as capably as possible in an NBC environment.

Chemical defense troops have two primary missions: NBC reconnaissance and NBC decontamination. Their basic missions include—

- Reconnoitering known or likely areas of NBC contamination.
- Warning troops of the presence of NBC contamination.
- Monitoring changes in the degree of contamination of troops positions.
- Monitoring the NBC contamination of personnel, weapons, and equipment.
- Performing decontamination of personnel, weapons, clothing, equipment, vehicles, troop positions, and sections of roads.

The basic chemical defense unit is the chemical defense company which is organic to tank and motorized rifle regiments. The company has an authorized strength of 35 to 50 personnel. At division level, there is a chemical defense battalion with an authorized personnel strength of approximately 200 men. A chemical defense battalion is also organic to each combined arms and tank army. These battalions are larger than the ones organic to divisions and at full strength consist of several hundred personnel. The largest chemical defense troop unit is the chemical defense brigade subordinate to military districts and probably subordinate to Soviet groups of forces stationed in non-Soviet Warsaw Pact nations.

The reconnaissance and decontamination elements of chemical defense units are rarely employed as whole units. Commanders from military districts through regiments usually divide their chemical defense assets and assign them to their various maneuver units in a direct support role. No chemical defense units are subordinate to manuever battalions or companies. However, each tank and motorized rifle company has an NBC noncommissioned officer heading a small team of extra duty NBC specialists. Company- and battalion-level NBC specialists are capable of checking unit NBC equipment and conducting NBC training. They also help decontaminate personnel and equipment and perform limited NBC reconnaissance when regimental NBC support is unavailable.

NBC TRAINING

Training of Soviet ground forces in NBC defense is comprehensive and realistic. It covers recognition and detection of NBC agents, operation of NBC measuring and monitoring instruments, procedures for warning troops of NBC attack, self-protection, self-administration of antidotes, and decontamination. Realism is emphasized to the extent that live, albeit diluted, agents are occasionally used during training exercises.

NBC protective training actually starts long before a conscript enters military service. Soviet citizens are required to attend civil defense instruction as early as the second grade. This instruction takes place during the years of formal education and continues at factories and collective farms. Also, youth organizations such as the Pioneers, *Komsomol,* and DOSAAF teach NBC defense subjects. So when the typical Soviet male is drafted, he already knows how to use a protective mask. He is familiar with the effects of NBC weapons and knows correct procedures for protecting himself.

Ground forces' training programs integrate NBC defense with other training. NBC training is conducted along with firing exercises, tactical problems, field exercises, and specialist—such as engineer—training. While qualifying at a rifle range, troops frequently are required to wear their protective suits and masks. During tactical drills, such as penetration of an enemy defensive position, NBC attacks are simulated. Personnel receive orders to don protective gear, to button up inside combat vehicles, and take other appropriate actions. Following completion of their mission, exercise personnel decontaminate weapons, equipment, and themselves. During engineer training, ground forces combat troops learn to perform engineer duties required in a NBC environment. Such duties include upgrading personnel shelters to provide for NBC defense and clearing rubble and obstructions following a nuclear blast.

Premilitary Training

The 1967 Soviet Law on Universal Military Service instituted a program of premilitary training for Soviet youth, both boys and girls. This training takes place in general education schools, technical-vocational schools, factories, and collective farms. Premilitary training consists of 140 hours of instruction. Civil

defense, and particularly NBC defense, subjects account for 35 of the 140 hours of instruction. Although premilitary training in schools normally begins with the ninth grade, Soviet youth receive limited NBC training, primarily consisting of protective mask drills, in the second and fifth grades as well.

Premilitary training in NBC defense consists of both theoretical and practical instruction, with the practical accounting for more than half of the training received. Theoretical training includes classes on the types of nuclear, chemical, and biological weapons found in foreign armies; their physical properties and means of employment; and the effects of weather and terrain on their employment. During practical instruction conducted in classrooms and on training fields, youths learn how to defend themselves against NBC weapons, construct shelters and slit trenches, administer first aid for NBC-related wounds, use NBC protective masks, conduct reconnaissance and rescue work in contaminated areas, and decontaminate personnel and equipment.

Besides premilitary instruction at school and on the job, Soviet youth must attend a summer camp for about 5 days. These camps emphasize field training in the same military subjects taught previously in schools, factories, and collective farms. Instruction in NBC defense equipment and procedures is an important part of the program. The camps normally are set up at training areas of nearby military units. Trainees compete with one another in a program that is closely integrated with a physical fitness program. Those who excel are awarded badges.

Besides the NBC portion of the required 140 hours of premilitary instruction, Soviet youths receive NBC defense training through voluntary participation in the activities of DOSAAF, *Komsomol,* and Pioneers. The annual military games (known as *Zarnitsa* and *Orlenok)* conducted by the Pioneers and *Komsomol,* respectively, also provide NBC defense training for Soviet youths before induction. (More information on DOSAAF, *Komsomol,* and Pioneers can be found in *FM 100-2-2.*)

Unit Training

Following basic training and on assignment to a unit, a Soviet soldier's training builds from simple to complex and from theory to practice. This is particularly true of NBC defense training, which begins with theoretical classroom instruction on NBC weapons and how to defend against them. It continues with training drills conducted both in classrooms and at specially equipped field training sites where troops rehearse individual training topics. This three-tiered training program culminates with field exercises aimed at testing ground force capability to perform in an NBC environment.

The chemical service chiefs of regiments and divisions plan and supervise NBC defense training. At battalion, a chemical instructor, probably a warrant officer or NCO, performs this function.

Theory. Theoretical instruction normally is given by platoon commanders and begins in classrooms with lectures on the physical properties and effects of chemical and biological agents and nuclear explosions. Trainees also learn how weather and terrain influence the use of NBC weapons and the persistent contamination of various objects by NBC agents. Instructors familiarize troops with the types of NBC weapons found in military organizations of the West and their methods of employment. Training aids include posters depicting the various stages of a nuclear blast, mockups of munitions used to disseminate chemical and biological agents, and film strips depicting the effects of NBC weapons.

During classroom sessions, information on the destructive characteristics of NBC weapons is balanced with instruction on protective aspects of the terrain, man-made shelters, and defensive NBC equipment. While Soviet soldiers are taught to respect the destructive power of NBC weapons, they are also indoctrinated against viewing combat in an NBC environment as hopeless. For example, while studying the characteristics of the shockwave and fallout of a nuclear burst, trainees also learn that the nature and number of troop casualties depend on their position and degree of protection at the moment of blast, distance from the burst, and yield of the weapon.

Training Drills. Following classroom instruction, soldiers participate in drills to practice putting on protective masks and protective suits, administering antidotes, and decontaminating themselves and their equipment. Specific drills are performed until proficiency is attained. Later, during the tactical exercise phase of the training program, all the various NBC defense measures are practiced. When participating in the drills, troops normally train by squads and the entire training effort is led by platoon commanders. The soldiers are tested on their performance within specified time limits. They also are evaluated on the length of time that they are able to wear a mask and protective suit while performing routine military tasks such as marching, loading equipment, firing weapons, and working with various types of instruments.

Field Exercises. After attaining the necessary level of competence, personnel are ready for the third stage of NBC defense training: the performance of NBC defense measures during field exercises. During exercises such as an attack against a fortified position, motorized rifle troops are made to cross simulated zones of contamination in full protective gear, to perform decontamination of weapons and equipment, and to practice the administration of chemical agent antidotes. Occasionally exercises are conducted with training type agents.

During a march, simulated NBC attacks frequently occur and subunits are forced to react accordingly. They disperse along the road at specified intervals, cross "contaminated" zones while observing correct NBC defense measures, conduct brief halts to perform limited decontamination, and then continue their advance. Troops don masks and protective suits while on the march and during the conduct of firing training.

During tactical exercises conducted under simulated NBC conditions, maximum use is made of available training aids and actual equipment to heighten realism. Mockups of destroyed combat vehicles obstruct march routes. Detonated minefields produce craters to hinder cross-country movement. Smoke-producing demolitions simulate nuclear clouds of nuclear attacks. Soldiers are notified of NBC attacks and contaminated areas as they would be during actual combat by preestablished signals over radios and by flares. During decontamination procedures, troops train with actual equipment. Combat troops also train jointly with chemical defense units during exercises that involve the decontamination of heavy equipment.

Training of Chemical Defense Troops

Soldiers assigned to chemical defense units of the ground forces also undergo a three-tiered training program in NBC defense. However, NBC defense training given to chemical defense troops is more detailed and wider in scope than that presented to regular ground force troops.

Following classroom instruction, chemical defense troops are divided into groups according to specialty and taken to training areas where they practice their particular skills. When training with a large and complex piece of equipment, such as a DDA decontamination station, experienced service personnel first demonstrate how to set it up and put it into operation. Then the trainees themselves do the work sequentially at a slow pace. After chemical defense trainees acquire competence in individual tasks, they perform the drill at a normal pace without interruption within a prescribed time limit. Next, they learn to work with their instruments in complicated conditions, such as while wearing NBC protective gear. Once proficiency is attained in this manner on a particular piece of equipment, cross-training within crews and between squads is practiced.

The third step in the training cycle is the performance of NBC specialist tasks within the framework of a tactical situation. While in the field, chemical defense exercises include—

- Reconnoitering "contaminated" areas of terrain.
- Measuring the intensity of "contamination" and posting warning signs.
- Transmitting NBC reconnaissance data by radio.
- Performing decontamination of vehicles, personnel, and equipment.

Like other ground forces elements, chemical defense personnel participate in competitions at the end of the training year.

In combat, chemical defense troop units would be divided. They would provide support directly to combat units. To train for such a role, chemical defense troops participate in the field training exercises of motorized rifle and tank units. Accordingly, NBC reconnaissance specialists constitute part of a forward detachment or advance guard of motorized rifle and tank units conducting march and offensive training. Decontamination units often set up their stations and practice decontamination of troops.

Training of Chemical Defense Officers

Some officers assigned to the chemical defense troops are graduates of officer training programs in civilian educational institutions, although most are trained at commissioning schools similar in many respects to US military academies. The Soviets presently maintain three service schools for chemical defense officers: the Saratov Higher Military Engineer School of Chemical Defense, the Tambov, and the Kostroma Higher Military Command Schools of Chemical Defense. All three provide students with a general military education as well as specialist training in NBC defense. The Saratov school involves a 5-year curriculum and trains cadets in engineering for technical positions in the chemical defense troops. Graduates are commissioned as lieutenant-engineers and are qualified as chemical engineers. The Tambov and Kostroma institutions are 4-year schools that train officers for command positions in the chemical defense troops. Graduates receive the rank of lieutenant.

After an officer has served a number of years in a chemical defense unit, he is eligible for further schooling in his speciality at the Timoshenko Military Academy for Chemical Defense located in Moscow. Applicants must have graduated from a higher military school, such as the Tambov, Saratov, and Kostroma schools; have at least 2 years of practical troop experience; and pass an entrance examination. Applicants who are not accepted for resident study may apply for a correspondence program. Most officers who attend the academy are senior captains and majors. Successful completion of the course is a prerequisite to further advancement.

PROTECTIVE MEASURES

Basic tactical measures for protection against NBC weapons include dispersion, rapid movement, deception, and camouflage. Other measures call for continuous contact with the enemy ("hugging") or withdrawal from expected nuclear target areas.

NBC Protective Equipment

Basic personal protective measures begin with NBC protective equipment. Such protective equipment issued to the ground forces, when used correctly and in combination, provides protection against harmful agents that attack through both the respiratory system and the skin. They also reduce the degree of injury caused by thermal and light radiation emitted during a nuclear explosion. More important, Soviet NBC protective equipment enables combat troops to operate on contaminated terrain, which allows the continuous conduct of combat operations. Troops don their protective masks and cover themselves with their protective capes the instant of an NBC attack. They don their protective suits, gloves, and boots to the degree required after the agents settle.

Troops normally are notified of an NBC attack or contaminated areas by chemical observers who make use of preselected signals: flares and radio transmission of codewords. The warning then is passed on by voice and vehicle horns. Troops having firsthand knowledge of an NBC attack or contaminated area take appropriate action immediately, without awaiting the signal or an order to do so. Vehicles with troops riding in open beds or on top of them stop briefly to allow the troops to don their protective masks and capes.

Depending on the location of troops, the circumstances surrounding an NBC attack, and the type of agent employed, various protective measures are adopted, either separately or in combination.

A significant characteristic of most NBC protective suits, including Soviet models, is the physical burden associated with prolonged wear, especially in warm temperatures. The suits are bulky and uncomfortable. When worn fully buttoned-up for an extended period of time in hot weather, soldiers become fatigued quickly and combat efficiency is lowered. In some cases, heat prostration may result. Accordingly, the Soviets have devised norms stipulating desired maximum lengths of time for various temperature ranges for wearing NBC protective suits.

Wearing Periods for NBC Protective Suits

TEMPERATURE (CENTIGRADE)	MAXIMUM TIME SPENT IN PROTECTIVE SUIT
30° and above	15 to 20 minutes
25° to 29°	Up to 30 minutes
20° to 24°	40 to 50 minutes
15° to 19°	1.5 to 2 hours
Below 15°	More than 3 hours

The Soviets use these norms as guidelines only, realizing that certain situations may require troops to wear protective suits beyond desired maximum times. In most chemical environments, troops leave the bottom of the protective suit unbuttoned to reduce the heat load.

Besides intensification of training, the Soviets advocate the use of collective protection systems, such as shelters and combat vehicles equipped with filter and ventilation systems. When riding in non-NBC protected combat vehicles, personnel need only don protective masks during an NBC attack or when crossing contaminated terrain. They do not need to wear protective suits, masks, gloves, or boots when riding inside NBC protected vehicles. One drawback of collective protection systems is that personnel exiting a shelter or vehicle cannot return until they completely decontaminate or remove their protective clothing to avoid contaminating the inside of the shelter or vehicle.

NBC Reconnaissance

This is performed by chemical defense personnel assigned to reconnaissance elements of chemical defense units. NBC reconnaissance involves two general types of activity—NBC observation posts and NBC reconnaissance patrolling.

Although normally staffed with chemical defense specialists, NBC observation posts can be manned by combat troops who have received special training. The functions of NBC observation posts are to detect NBC contamination, to determine radiation levels and types of toxic substances, to monitor the drift of radioactive clouds, to notify higher headquarters of NBC information, as well as meteorological data, and to give the general alarm to threatened troops. An NBC observation post normally consists of three or four observers located near the command post of a combat unit. During movement, the NBC observation post moves in its own vehicle in close proximity to the combat unit commander.

On detecting NBC contamination, the observers measure the intensity of radioactivity or determine the type of chemical or biological agent and report this information to the supported commander. The commander plots the information on his map and reports to the next higher headquarters. NBC reconnaissance posts report directly to the supported commander rather than to the commander of their chemical defense unit. To accelerate the transmission of information, a standardized radio message is used.

In the event of an enemy nuclear attack, observers switch on their detection instruments immediately after the shock wave passes. The observers estimate the type and location of the burst and the direction of movement of the contaminated cloud. They then give the general warning and notify the unit commander.

When operating in chemical reconnaissance patrols, chemical defense personnel travel in reconnaissance vehicles specially equipped with NBC detection and warning devices. The Soviets also have experimented with the use of helicopters to perform NBC reconnaissance. Helicopters equipped with chemical and radiological area survey instruments are particularly useful for performing reconnaissance of areas with extremely high contamination levels. Helicopters also aid in screening large areas of terrain when time is limited.

The reconnaissance assets of chemical defense units, such as the chemical reconnaissance platoon of a chemical defense company, can reconnoiter a large contaminated area or be divided into squads and attached to combat units to perform reconnaissance of multiple routes. Before starting a mission, a chemical reconnaissance patrol receives the following information from the chemical reconnaissance platoon leader:

- Enemy situation, route(s) or area to be reconnoitered.
- Times for beginning and completing the reconnaissance; to what point, line, or level of radiation to conduct the reconnaissance.
- Procedures for submitting reports and messages.
- Interval for switching on detection instruments.
- Signals to be used for warning troops of contamination or enemy NBC attack.
- Location of the assembly area to be occupied by the patrol following completion of the reconnaissance mission.

Before a patrol begins its mission, personnel check their individual NBC protection equipment and detection instruments. They also examine the NBC and communication equipment located on their reconnaissance vehicle. As they begin their reconnaissance, patrol members don their individual protective gear.

If only one route is to be covered, it is divided into 1 to 2 kilometer segments and reconnoitered by the patrols in leapfrog fashion. When performing NBC reconnaissance of multiple routes, one patrol is assigned to each route. If NBC reconnaissance is being conducted in support of a march, the patrol operates well in front of the main body. The patrol may operate as part of a forward security element or combat reconnaissance patrol, or it may move along a separate route. The patrol leader normally makes reports to the maneuver unit commander for every 2 or 3 kilometers of route his patrol reconnoiters.

As a patrol performs its mission, a designated crewman constantly observes the readings of the onboard NBC survey meters. If radioactive or chemical contamination is discovered, the patrol immediately determines the radiation level or type of toxic substance present. The patrol leader plots contaminated areas on his map, reports to his commander, and orders his patrol to mark the contaminated areas with warning flags that are dispensed mechanically from a device mounted on the rear of the reconnaissance vehicle. The patrol designates bypass routes around contaminated areas or finds routes through the area with the lowest levels of contamination.

In the event of nuclear contamination, bypass routes normally are sought when radioactivity encountered by a patrol measures above 30 roentgens per hour. Otherwise, routes normally are found through the contaminated area that have the lowest levels of contamination. When establishing bypass routes, a patrol returns to the assigned routes as soon as practicable.

On completion of its mission, an NBC reconnaissance patrol moves to its assigned assembly area, where final reports are made and patrol members are debriefed. Patrol members also decontaminate themselves, their individual NBC protective gear, and their vehicle and its equipment.

Decontamination Procedures

Soviet doctrine prescribes that in the event of contamination, a combat unit should conduct a partial decontamination with organic equipment and solutions no later than one hour after having been subjected to NBC contamination. This entails a brief halt while troops decontaminate themselves and their clothing, their individual weapons, crew-served weapons, and combat vehicles. If a unit is forced to conduct partial decontamination in the contaminated area, personnel remain in NBC protective gear while doing so. Following the completion of partial decontamination, the unit immediately resumes its mission. After a unit accomplishes its mission, but no later than 5 hours from the time of contamination, it should undergo complete decontamination of personnel, clothing, NBC protective gear, armament, and equipment.

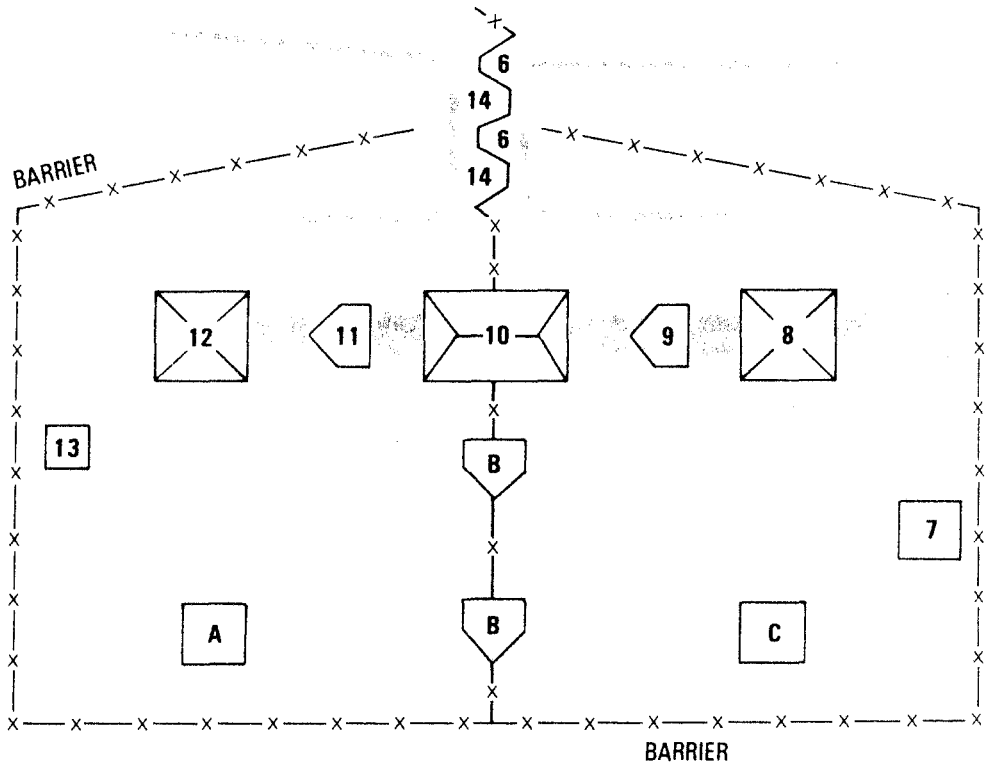
Complete decontamination of a maneuver unit is performed by chemical defense troops. As with chemical reconnaissance elements, decontamination units of chemical defense companies and battalions can operate either as a whole or in smaller elements. Decontamination units deploy to areas where contaminated combat units are located. They set up near movement routes or establish centrally located decontamination points to serve several troop units.

Before deploying his equipment, the commander of a decontamination unit dispatches a reconnaissance group to select a favorable site, mark off areas with pegs for setting up the various pieces of equipment, and establish and mark routes of entry and exit for the site. Sites are selected that provide natural concealment, good approach routes, terrain protection, and sources of uncontaminated water. After decontamination stations are set up, the decontamination unit commander orders security measures against enemy observation or attack. This normally includes making use of natural concealment, employing camouflage, and digging tr
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Movement of Personnel for Decontamination





STEPS

1. Initial reception of personnel for decontamination.
2. Decontamination of weapons and protective equipment.
3. Checking the decontamination of weapons and protective equipment.
4. Removal of protective clothing (except protective mask).
5. Treatment of outer clothing.
6. Stacking of individual weapons and protective equipment.
7. Treatment of protective mask and exposed parts of the body.

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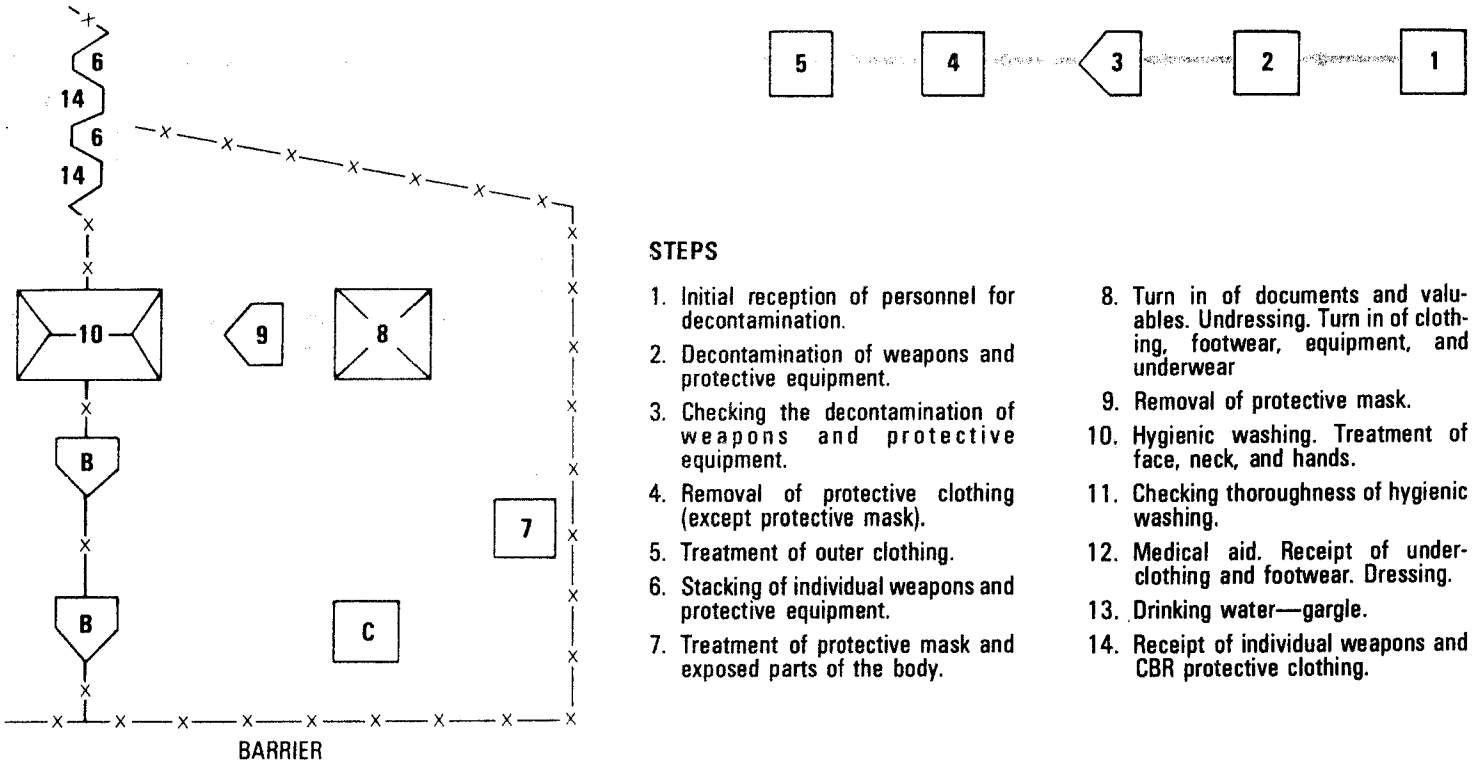
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Crews remain in their vehicles while the vehicles are decontaminated. To decontaminate their vehicles, operators drive in columns past two TMS-65s, one located on each side of the road, operated by chemical defense troops. If TMS-65s are not available, ARS-12s or 14s may be used, although they are not as fast as the TMS-65s. After decontamination, each vehicle is checked for any remaining contamination.

Troops then proceed to the personnel decontamination stations, which are set up in tents. The major piece of equipment used to supply warm water for showers and to decontaminate clothing is the DDA-53 or DDA-66 steam chamber vehicle. (More information on decontamination equipment can be found in FM 100-2-3.)

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STEPS

1. Initial reception of personnel for decontamination.
2. Decontamination of weapons and protective equipment.
3. Checking the decontamination of weapons and protective equipment.
4. Removal of protective clothing (except protective mask).
5. Treatment of outer clothing.
6. Stacking of individual weapons and protective equipment.
7. Treatment of protective mask and exposed parts of the body.
8. Turn in of documents and valuables. Undressing. Turn in of clothing, footwear, equipment, and underwear
9. Removal of protective mask.
10. Hygienic washing. Treatment of face, neck, and hands.
11. Checking thoroughness of hygienic washing.
12. Medical aid. Receipt of underclothing and footwear. Dressing.
13. Drinking water—gargle.
14. Receipt of individual weapons and CBR protective clothing.

LEGEND
A Storage - clean. B DDA 53 C Storage - contaminated.

COMBAT IN AN NBC ENVIRONMENT

A maneuver unit commander receives much of his initial information regarding the NBC situation in combat orders issued by a higher unit. He supplements this information with intelligence acquired by his own reconnaissance assets. As he makes his estimate of the situation, he considers:

- Effects of the present NBC situation on organization of forces for combat; influence of possible enemy use of NBC weapons.
- Condition of NBC protective equipment, concealment and cover in the area of activity.
- Meteorological conditions that might influence the movement of contamination.

Based on his estimate, the commander issues instructions to his subordinates. These instructions include missions for attached and organic NBC reconnaissance elements, special measures to be taken while crossing contaminated terrain, the subunits responsible for conducting rescue work in the event of enemy NBC attack, and signals to be used for warning of the enemy NBC attack.

Two different sets of NBC warning signals normally are designated—one for nuclear attack or contaminated area encountered and one for chemical or biological agent situations. If an NBC warning signal is given on a march or during an attack, exposed troops must halt to don protective masks and protective suits and then continue their mission. NBC protective gear is removed only on the commander's order.

Once subjected to an NBC situation, the commander is required to make periodic reports regarding his unit's exposure to contamination. Reports include the amount of contamination received by platoons as a whole and by officers individually. If exceptionally high levels of contamination are experienced, reports are made immediately.

If a unit is subjected to an enemy NBC strike, the commander organizes reconnaissance of the area of destruction or contamination, restores communications, and orders predesignated subunits to begin rescue operations. In addition, he reports losses to his superior and appoints replacement commanders.

Actions During the March

Before conducting a march, the commander issues his march order, which designates those subunits assigned to conduct NBC reconnaissance, signals used to warn of NBC attack or contaminated areas, and recovery procedures following an NBC attack. The following is an example of a motorized rifle battalion commander's instructions regarding NBC aspects of a march.

Commander's Orders in an NBC Situation

During the march, a chemical reconnaissance squad will advance with the combat reconnaissance patrol. The chemical reconnaissance squad is responsible for marking contaminated areas and measuring intensity levels of contamination. Communications with the squad will be through the commander of the combat reconnaissance patrol. A chemical observation post will be established at the battalion command post, and chemical observers will be assigned to the companies.

The NBC warning signals are a red flare shot into the air and the word *Groza* transmitted over the radio.

On my order, antiradiation tablets* are to be taken by personnel.

Contaminated areas will be crossed at maximum speed and with troops in NBC protective gear. Distance between vehicles during transit will be 100 meters.

* Soviet antiradiation tablets are contained in individual medical kits. The Soviets have fielded a number different types of tablets, some of which are mildly effective or are of very little benefit. At most, tl tablets can only treat initial symptoms of radiation sickness, such as headaches, dizziness, and nause

The Offense

If a force occupies an assembly area before initiation of an attack, personnel and equipment are dispersed to ensure maximum protection against enemy use of NBC weapons. A distance of 50 meters is prescribed for vehicle intervals. Companies are separated by at least 1.5 kilometers. Commanders notify subordinates of NBC warning signals and the measures to be taken under NBC attack. Contingency plans are developed governing the restoration of control, reconstitution of combat units, and evacuation of personnel and equipment.

If an enemy force employs NBC weapons during any phase of the attack, Soviet forces are to take precautionary measures immediately. They don their protective gear, and continue their advance. They then perform a partial decontamination as soon as possible.

If a defending enemy force conducts a withdrawal, attacking units commence pursuit operations. Close contact during pursuit restricts a withdrawing enemy's use of NBC weapons since, in using them, he would endanger his own troops.

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On my order, antiradiation tablets* are to be taken by personnel.

Contaminated areas will be crossed at maximum speed and with troops in NBC protective gear. Distance between vehicles during transit will be 100 meters.

By 2000 hours today, all units must verify the supply and condition of their NBC equipment, to include individual protective clothing, reconnaissance instruments, decontamination equipment, and vehicle collective systems.

Following transit of contaminated areas, partial decontamination will be performed on order of the company commanders at the first halt.

If the enemy attacks our columns with NBC weapons, wounded personnel will be evacuated to the battalion medical point.

Destroyed vehicles and equipment should be moved to the side of the road. My deputy commander is in overall charge of all recovery operations following an NBC strike.

Prior to initiation of the march, a review is to be conducted with battalion personnel regarding actions on contaminated terrain and the conduct of partial decontamination.

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If a defending enemy force conducts a withdrawal, attacking units commence pursuit operations. Close contact during pursuit restricts a withdrawing enemy's use of NBC weapons since, in using them, he would endanger his own troops.

Following an attack, subunits assemble as soon as possible for complete decontamination performed by chemical defense troops.

The Defense

Before occupying defensive positions, chemical reconnaissance squads survey the area and mark any contaminated sectors. Chemical observers are assigned to company and battalion command posts and to artillery firing positions. To attain reliable NBC protection, chemical observation posts of two or three observers are established throughout a defensive position at a ratio of one post for each 2 to 2.5 kilometers of defensive area. During bad weather, more chemical observation posts normally are set up. Observers periodically switch on their NBC detection instruments and make reports as prescribed in the commander's combat order.

If a defending force is subjected to a NBC attack, chemical reconnaissance squads determine the type

and intensity of contamination and mark contaminated sectors. Partial decontamination and first aid are performed, and defensive structure is reestablished.

Before a withdrawal, chemical reconnaissance patrols reconnoiter withdrawal routes, mark contaminated sectors, and establish bypass routes. Withdrawing main body forces travel over multiple routes and in dispersed formation for protection against enemy NBC attacks.

Recovery Operations

Commanders at all levels plan recovery operations to be undertaken in the event of NBC attacks. Recovery operations entail restoring control, reconnoitering the area of destruction, conducting rescue work to include repair of vehicles and evacuation of wounded, extinguishing fires, performing decontamination of personnel and equipment, and forming new combat units from surviving ones and reinforcements.

Depending on the situation and availability of forces, recovery detachments are either formed from organic subunits or made available by higher headquarters. If formed from organic units, they normally come from the second echelon or reserve of a combat force. Regardless of origin, recovery detachments are established and receive a general mission before the conduct of an operation. The detachments usually include chemical reconnaissance, motorized rifle, engineer, medical, and vehicle repair personnel.

Following an NBC attack, the unit commander orders the implementation of recovery measures and gives the priority of their implementation. Chemical reconnaissance patrols are normally the first to reach the area of destruction. They determine the nature and intensity of contamination and mark contaminated

Actions Performed During Recovery Operations

IN THE EVENT OF ENEMY NUCLEAR ATTACK	
AREA RECONNAISSANCE:	Determination of approach routes to locations of affected units; measurement of radiation levels. Determining degrees of destruction, presence of fires, and losses in manpower and equipment. Selection of evacuation routes and points for gathering sick and wounded and damaged equipment.
RESCUE WORK:	Determination of amount and sequence of rescue work. Finding wounded and sick and getting them out of damaged equipment and combat vehicles.
PERSONNEL AND EQUIPMENT EVACUATION:	Rendering first aid to wounded and sick. Removing them to collection points and evacuating them to the medical post. Evacuation of damaged equipment from the area.
DECONTAMINATION:	Decontamination of personnel, weapons, and equipment.
IN THE EVENT OF ENEMY CHEMICAL ATTACK	
CHEMICAL RECONNAISSANCE:	Determination of type of toxic agent used by enemy and designation of boundaries of contaminated area. Selection of evacuation routes and areas for deployment of medical post and decontamination station.
RESCUE WORK:	Finding the injured, getting them out of combat vehicles and engineering equipment. Putting protective masks on wounded, administering first aid and chemical agent antidotes.
PERSONNEL AND EQUIPMENT EVACUATION:	Removal of wounded to medical post. Administration of antidotes as necessary. Preparing wounded personnel and unmanned equipment for evacuation.
DECONTAMINATION:	Decontamination of personnel and degasification of equipment and weapons.

sectors. The recovery detachment commander appoints new unit commanders to replace casualties. He selects locations for setting up a medical aid station, NBC contamination station, damaged-vehicle collection point, and an area for reconstituting units. He also designates routes for reinforcement and evacuation to and from the area. He then reports to his next higher commander on the situation and the measures taken. Meanwhile, engineers assigned to the damage control detachment clear rubble, extinguish fires, rescue personnel, and build temporary roads. Personnel and vehicles that are fit to return to duty are decontaminated first. The final step consists of forming new units and equipping them with weapons and combat vehicles. While the recovery detachment performs its mission, elements from a combat unit's second echelon or reserve that were not affected by the enemy NBC attack provide security by screening against any further enemy activity.

CONCLUSIONS

The Soviet Army is the best prepared force in the world to conduct both offensive and defensive NBC operations. Numbering 80,000 to 100,000 personnel, chemical defense troops are capable of accomplishing a number of tasks in support of combat troops. They have a wide variety of dependable equipment which, for the most part, is in good supply. Individual items of equipment are adequate to protect from contamination for hours, days, or longer, depending on the nature and concentration of the contaminant. Antidotes provide protection from the effects of Soviet agents as well as those of Western countries. Agent detector kits and automatic alarms are available in adequate quantities and are capable of detecting all standard, agents. Timely detection and warning of an attack, however, remain a problem.

Besides providing their troops with dependable protective equipment, the Soviets place heavy emphasis on individual NBC protective training which attempts to psychologically temper personnel to the demands of NBC warfare. Soviet troops are subjected to realistic and stressful situations while learning the technical skills needed to operate in NBC environments. Up-to-date instructional materials are widely available. Training is generally comprehensive and realistic. Individual protection, reconnaissance, and decontamination are all stressed.

GLOSSARY

ACRONYMS AND ABBREVIATIONS

AAA .....antiaircraft artillery
AAG .....army artillery group
AAICV .....airborne amphibious infantry combat vehicle
ACRV .....artillery command and reconnaissance vehicle
ACV .....armored command vehicle
AGI .....auxiliary intelligence gatherers
AICV .....amphibious infantry combat vehicle
AMRP .....artillery mobile reconnaissance post
An-(no.) .....Soviet designation for aircraft from Antonov design bureau
APC-T .....armor piercing capped tracer round
API-T .....armor piercing incendiary tracer round
AP-T .....armor piercing tracer round
APVO .....Aviation of National Air Defense
AS-(no.) .....US designation for Soviet air-to-surface missile
ASC .....armored scout car
ASM .....air-to-surface missile
ASW .....antisubmarine warfare
AT-(no.) .....US designation for Soviet antitank guided missile
ATGM .....antitank guided missile
BAF .....battalion assault force (naval infantry)
BVR .....beyond-visual-range
CBU .....cluster bomb unit
CES .....chief of engineer services
CINC .....commander-in-chief
COMINT .....communications intelligence (US term)
COP .....command observation post
CRP .....combat reconnaissance patrol
CRTA .....chief of rocket troops and artillery
DAG .....division artillery group
DF .....direction finding
DOI .....date of introduction
DOSAAF .....Voluntary Society of Assistance to the Army, Aviation, and Navy (premilitary training organization)
DZ .....drop zone
ECM .....electronic countermeasures
ELINT .....electronic intelligence (US term)
EMP .....electromagnetic pulse
ESM .....electronic warfare support measures (US term)
FAC .....forward air controller
FEBA .....forward edge of the battle area (US acronym used in this manual as the equivalent of the Soviet term "forward edge")
FOP .....forward observation post
Frag-HE .....fragmentation high-explosive round
FROG .....free rocket over ground
FS .....fin-stabilized round
FSE .....forward security element (of the Advance Guard)
GAZ-(no.) .....medium truck produced by Gorkiy Motor Vehicle Plant
GRU .....general staff's main intelligence directorate
HE .....high-explosive round
HEAT .....high-explosive antitank round
HEI .....high-explosive incendiary round
HEP .....high-explosive plastic round
HVAP .....hyper-velocity armor piercing round
HVAPFSDS ..hyper-velocity armor piercing fin-stabilized discarding Sabot round
IFV .....infantry fighting vehicle
Il-(no.) .....Soviet designation for aircraft from Ilyushin design bureau
INA .....information not available at the UNCLASSIFIED level
IR .....infrared
IRBM .....intermediate-range ballistic missile
I-T .....incendiary tracer round
KamAZ-(no.) .medium truck produced by Kama River Motor Vehicle Plant
KGB .....Committee for State Security
KrAZ-(no.) ....heavy truck produced by Kremenchug Motor Vehicle Plant
LMG .....light machinegun
LOC .....line of communications
LOP .....lateral observation post
LRA .....long range aviation
LuAZ-(no.) ....light truck produced by Lutsk Motor Vehicle Plant
LZ .....landing zone