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Table of Contents

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CERTAIN HISTORIC TRENDS IN THE DEVELOPMENT OF TROOP CONTROL

by Maj Gen N. KOMKOV and Col P. SHEMANSKIY

One of the greatest problems of modern military art is the need to perfect the control of troops on all levels -- strategic, operational, and tactical. For the solution of this problem it is very important to consider constructively trends in the development of troop control related to the changes occurring in the means and methods of armed warfare. In this article we shall discuss certain of these historic trends.

In the era of smooth-bore weapons and small armies, the result of operations, and even of an entire war, was sometimes decided by one or two general engagements. Combat operations took place over a comparatively small area. In the Battle of Borodino, for example, operations involved a front of 8 kilometers and a depth of 4 kilometers. The organization and disposition of forces on the battlefield was comparatively simple and uniform. There were only three combat arms: infantry, cavalry, and artillery. As a rule, there was a considerable interval between the approach, or march, and the start of the battle. There were no operations in the modern sense.

These conditions were best met by an organization for the control of troops under which the commander, or leader, handled questions on both the strategic and tactical levels. He personally prepared the plan of battle or disposition in every detail, watched the development of operations, coordinated the efforts of subordinate troops and, when necessary, clarified in detail their assigned missions and sent fresh troops into action from reserve forces. Orders and instructions to subordinate commanders were issued by the commander directly or through orderlies, as well as by signals. The functions of the tactical elements were required, above all, to exhibit personal bravery, to be able to summon their subordinates into hand-to-hand combat with the enemy or to storm his positions. Staffs, as organs of control, for a long time were nonexistent. At first they were established only under commanders in chief, then, in the beginning of the 19th century, under commanders of division and regimental-level units. Their role in this period amounted to the writing and transmittal of instructions from military chiefs, and the organization of troop transfers and billeting. Operations support was limited to the organization of reconnaissance and the securing and supply of ammunition, food, and forage to the troops.

With the arrival of mass armies and the introduction of rifled weapons and motor vehicles in combat forces, the character of combat operations underwent great changes, graphically illustrated by the events of World War I, the 50th anniversary of the start of which is being observed this year.

Armed conflict took place over vast areas. Armies numbering many millions took part. Not only army, but also front, groups were established. Tank, engineer, and chemical units at regimental level, and signal units at regimental and company level, came into being. Ground troop operations were supported by air forces. The defeat of a strong enemy, and certainly the termination of the war, became impossible to achieve through one or two general engagements. Battles and engagements took on a prolonged character and the interval between the march and the start of action was shortened. Ground troops operations took a definite form. The operational structure, or combat formation, included several echelons and other elements.

With these changes in the means and methods of armed conflict, the number and complexity of problems regarding control sharply increased at all command levels, the time available for resolving them decreased, and the requirements for control increased, particularly with regard to providing unwavering, uninterrupted control.

Under these conditions, personal control by the troop commander over all aspects became impossible. The need became more apparent for a division of functions and areas of responsibility among strategic, operational, and tactical commands, and between command and staff. The great scale and complexity of armed conflict required that the strategic command concentrate chiefly on planning and determining the general goals of operations and the war as a whole, on the distribution of personnel and materiel and the coordination of operations of front ob"yedineniya, and on the organization of the supply of all necessary reserves to the combat forces. For influencing the progress of the armed conflict it was necessary to retain under the strategic command, in addition to general reserves, a certain quantity of new types of combat materiel, principally aircraft and tanks. However, the outcome of the fighting, as before, was determined on the battlefield. Tactical determined operational, and operational determined strategic successes.

With the strategic command beginning to deal chiefly with problems relating to the supervision of the war as a whole, and combat operations extending over great areas and becoming relatively independent, the role of the operational and tactical commands in the organization of operations increased considerably. Their sphere of activity expanded. The role of staffs as organs of control also increased, particularly in the organization of reconnaissance, the collection and analysis of data on the situation, and the organization of stockpiling and supply, antiair and antitank defense, and chemical defense. To ensure firm control of troops, control points were established, situated at a considerable distance from the front line. For contact with the troops, the telephone, telegraph and, later, radio began to be widely used. It was no longer enough for tactical commanders to exhibit personal bravery and be able to lead their subordinates in storming enemy positions. They now had

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to be able to evaluate the situation thoroughly and reach the correct decision independently, to demonstrate great initiative and energy in its implementation, and to ensure and support close coordination among the various combat arms (infantry, artillery, cavalry, tanks, etc.).

Under such conditions, the assignment of dispositions to subordinates indicating in full detail where, with what, and how to proceed leads to highly undesirable consequences and even defeat. The Russo-Japanese War confirmed this vividly. The minutely detailed dispositions devised by the main staff of the Russian army and assigned to the troops as a rule did not conform to the situation developing at the front. Moreover, subordinates were not authorized to change the scheme of operations stipulated in the dispositions, with the result that they seldom entered battle under favorable circumstances, and the objective of the operation was not achieved. Reality repudiated the disposition as a form of assignment of combat missions to subordinates, which provided the most detailed description, often with several variants, of the methods of execution. It was replaced by the directive, or combat order, in which combat missions were indicated without instructions on methods of execution. Conditions were thereby created in which subordinate commanders would exhibit originality and independence in the fulfillment of assigned missions, under the general centralized control of senior command levels.

Great changes in the control of troops occurred during the Civil War. It is particularly noteworthy, in our opinion, that the extremely difficult situation in which the young Soviet republic found itself required a further centralization of supervision of the armed struggle in the strategic command, which decided such questions of troop control as the coordination of the operations of several fronts, the organization and accomplishment of the successive defeat of the enemy on the various fronts of the war, and the employment of large mobile (cavalry) units, which were the principal means for rapid shifting of effort from one direction to another and for exploitation of a success. In the absence of continuous fronts, a greatly increased role went to operational and tactical headquarters, which often had to make decisions with only the most general information and understanding of the situation on other sectors.

A tremendous, indeed inestimable, contribution to the organization of troop supervision was made by V. I. Lenin. He taught that the foundation of troop supervision on the part of strategic, operational, and tactical commands must be bold thinking, decisive goals, dynamic combat operations and maneuver, and the conduct primarily of offensive operations directed to the complete, rapid defeat of the enemy. V. I. Lenin provided a perfect example of the practical combination of political and military leadership of the country and the armed forces in wartime, and of the correct manner of work for all leaders, including commanders and

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staffs at all levels. The basic features of this manner are selfless loyalty to the cause of communism and the socialist motherland, hatred of the enemy, high idealism, party-mindedness, principle and organization in work, correlation of theory and practice, constant contact with the masses, faith in their strength, and a paternal concern for people. V. I. Lenin demonstrated the ability to evaluate a situation thoroughly and sensibly, to ascertain its principal elements, and to find the way out of any difficult situation. Bold thinking, concrete supervision, innovation, personal modesty, integrity, irreconcilability to shortcomings, and high vigilance were his traits.

The theory and practice of troop control was also enhanced during the years of peaceful development of the Soviet Armed Forces. Imaginatively studying the experience of World War I and the Civil War and the rapid development of all combat arms, particularly air, armored, and mechanized forces, our military thought, in the main, correctly foresaw the nature of a future war and elaborated the theory for the conduct of operations and battles in depth, as well as precepts on the supervision of the troops involved. This was greatly furthered by the publication of a number of theoretical works on problems of troop control by prominent Soviet military leaders, particularly the works of M. V. Frunze, M. N. Tukhachevskiy, and B. M. Shaposhnikov. It is appropriate to note that in Lenin's lifetime great significance was attached to the elaboration of scientific, philosophical, political, legal and psychological principles of administration, which promoted the development of supervision not only of the national economy, but also of the troops. However, this important branch of science was given inadequate attention during the Stalin personality cult.

According to the views formed by the beginning of the Great Patriotic War, the most important functions of strategic leadership were considered to be the preparation of plans for operations in depth involving the employment of all branches of the armed forces, the determination of the directions of main effort for achieving the goals of the war, the distribution of forces and materiel among the fronts, the organization of coordination among them, and general support to operations and preparation of the theater of operations. A great role in the decision of strategic questions was given to the front commands, inasmuch as fronts were considered operational or strategic units. The role of army commanders increased, particularly of shock armies, which were assigned very important operational missions.

On the basis of experience in past wars and in anticipation of the nature of a future war, it had been concluded that it was necessary to keep under the control of the High Command large units of tank, cavalry, and air forces as a means of decisively influencing the course of operations, and that reserves of materiel should be created.

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A properly defined role in the control of troops was assigned to staffs, which were considered organs for supporting commanders with necessary information on the situation, assigning missions to subordinates and controlling their fulfillment, aiding in the coordination of operations and providing general support.

Along with the elaboration of theoretical principles, a certain reorganization of organs of control was required. Here, the main purpose was to ensure the most purposeful training of all branches of the armed forces, combat arms, and special troops for war; planning of the war and supervision of the troops involved, from the very outset, without radical changes in control; close coordination between branches of the armed forces and combat arms, as well as more precise division of responsibilities between staffs and chiefs of arms and services.

The most important advances in the theory and practice of troop control occurred during the Great Patriotic War. The new features of armed conflict in this war were the participation of great masses of tanks and aircraft in operations, the employement of rocket artillery, and the complete motorization of infantry. Combat operations took on a more intense character, distinguished by high maneuverability and fast pace. Offensives were carried out against strong, deeply echeloned defenses. Offensive operations were characterized by increased determination and unprecedented scale. For example, in the summer-autumn campaign of 1944, the Soviet Army offensive extended over a front of 4,400 kilometers. The depth of forward movement of troops amounted to 500-700 kilometers. The average daily rate of advance was 25-30 kilometers, and in certain operations more.

The time required for the preparation of operations was significantly reduced. In the third period of the war, no more that 6-8 days were allocated for the preparation of most army offensive operations. A corps commander received his combat assignment 5-7 days before the start of the attack, a division commander 4-5 days, and a regimental commander 2-3 days.

Of course, under the conditions cited, troop control was concerned with the need to fulfill, in a relatively short time, a colossal number of extremely complex tasks involved in the preparation, execution, and support of operations and the organization of coordination among forces and weapons. The situation was further complicated in that certain problems of control were completely new. Before the war, in particular, there had been little research and exposition on such problems as the control of troops during operations to repel an enemy surprise attack and the committing of main forces under such conditions, during the organization and conduct of operations by groups of fronts, or during a retreat, a mobile defense, or a shift from defensive to offensive.

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These and other conditions required a new definition of the functions and sphere of influence of strategic, operational, and tactical commands, an improvement in the quality of training of command personnel, and improvement of the organizational structure and methods of operation of organs of control.

The nature of the war placed particularly great demands on the strategic leadership. From the very beginning of the war an agency was required which could ensure firm, flexible supervision of the country and the armed forces in the difficult situation. Such an organ of military-political leadership was established by decision of the Central Committee and the Soviet government -- the State Defense Committee. For direct supervision of the armed forces the Stavka of the Supreme Command was formed, headed by the chairman of the State Defense Committee, who was at the same time the leader of the party and government, and Supreme Commander of the Armed Forces. In comparison with the past, this arrangement of higher organs of control represented increased centralization, or merger, of general governmental and military leadership and, despite the known mistakes of Stalin, proved justified. It made possible the conversion of the country into a unified fighting camp and the attainment of victory over the enemy.

The principal working organ of the Stavka was the General Staff. The most important functions of the Stavka and the General Stall included the formulation of concepts of strategic operations, general support for these operations, the organization and implementation of coordinated action among branches of the armed forces and fronts, the readying of reserves, the operational and strategic movement and regrouping of troops, the supervision of combat forces during operations, and the analysis of results of combat operations.

In addition, the Stavka and the General Staff were concretely involved in matters of operational supervision. In the planning of many operations the front headquarters were not only informed of the concept and missions of the operation, but were instructed as to the directions of main effort; the composition and missions of striking forces, and their formations; the sequence in which tank armies, cavalry and mechanized groups, and second echelon forces were to be committed; the employment of air forces; the types of coordination between neighboring units and between branches of the armed forces; and supply and equipment measures. On this basis the front headquarters planned operations in detail and submitted their plans to the Stavka for approval. Sometimes the front commands, on their own initiative, submitted views on forthcoming operations to the Stavka. To assist front headquarters in the planning of operations and for organizing coordinated action between fronts, representatives of the Stavka were often detached to them along with small operational groups which then maintained control over the progress of combat operations.

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The actual decision of questions of an operational nature by the Stavka and the General Staff greatly complicated the organization of front operations and necessitated, in the planning of them, over-all consideration of the general strategic situation, the closest coordination of front operations, and the maximum employment of forces and materiel on decisive sectors for simultaneous or consecutive defeat of enemy groups.

The extremely complex character of the armed conflict and the great scale of operations, conducted simultaneously or consecutively along several axes, required that the strategic command, in order to have a decisive influence on the progress of combat operations, retain under its immediate disposition, in addition to the fronts, large reserve units (tank, mechanized, cavalry and air crops, tank and air armies, and even entire reserve fronts and substantial artillery elements and special troops) as well as great materiel reserves. During preparations for the summer-autumn campaign of 1943 the Stavka had in its control a specially created reserve front, several separate combined-arms and tank armies, the fronts, effected a favorable change in the correlation of forces and materiel on selected sectors, ensured an intensification of effort for exploitation of a success in an offensive or for repelling enemy assaults on the defensive, imposed its will on the enemy and achieved great strategic successes.

Conditions relating to the organization and support of troop control also changed at the front and army command levels. The volume and complexity of questions to be resolved here sharply increased in comparison with the past, and the time available for execution was reduced. The front and army commands were compelled to exhibit unprecedented firmness and flexibility of control and to ensure unbroken control. The chief functions of control were planning, over-all preparation and support of operations, and the supervision of forces during combat operations.

To ensure close coordination and massing of forces and materiel participating in operations, and prompt reaction to changes in the situation, the front commands retained decision-making authority in a number of matters which previously were within the sphere of army and even tactical elements of control. For example, they frequently instructed armies not only as to the goals and missions of operations and the composition of forces and materiel, but also the directions of main effort, breakthrough sectors, operational formations, and other matters.

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Similar conditions prevailed in the work of army commands which, in addition to their own immediate functions, often were occupied with questions relating to the organization of combat operations.

Rapid changes and abrupt development of the situation required extremely efficient response during combat operations. For this purpose the front commands retained in their own immediate disposition the most important weapons capable of enemy destruction over the entire depth of his operational formation, such as air forces, as well as the principal forces and materiel for exploitation of a success, such as a tank army and tank, mechanized and cavalry corps. Army commands formed artillery groups from the most powerful and long-range systems allotted to the armies.

Particularly rigid centralization was observed in control by front and army commands during the preparatory period of operations. It was necessitated chiefly by the difficulties involved in a breakthrough against enemy defenses. To a certain degree, it saved time and, primarily, it ensured the concentration and coordination of forces and materiel.

However, there often existed unwarranted centralization of control, which took the form of needless interference by front and army commanders in the functions of subordinates. Whereas such interference was justified to some extent at the beginning of the war when command personnel in tactical elements had not had sufficient combat experience, it became necessary, and even harmful, in the later period when the combat skill of commanders at all levels had considerably increased and the reduced time required for the preparation of operations and the sharp increase in maneuverability in combat operations demanded great independence, initiative and originality from commanders and staffs of tactical elements, particularly in the selection of methods for fulfillment of their combat missions. In such conditions, interference in their functions by operations-level commands adversely affected the results of combat operations.

In view of all these circumstances, the Stavka in 1943 issued a special directive by which senior chiefs were denied the authority to interfere without cause in the functions of subordinates, to control the troops "over their heads." These instructions from the Stavka played a very beneficial part in the achievement of success in battles and operations. They made it possible to combine centralization of control more closely with initiative and originality in subordinates, and to ensure more complete success in combat operations.

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[illegible] structure of control organs. The rapid development of all combat arms and special troops brought the need for the formation of organs headed by the respective commanders or chiefs, in order to ensure expert employment of new weapons, branches of the armed forces, combat arms and special troops and the uninterrupted supply of materiel reserves and combat equipment to the troops.

The role of combined-arms staffs increased still further in this connection, and their functions expanded. They were responsible for securing the closest harmony of all combat arms and special troops, and control over their fulfillment of combat missions.

Along with the clarification of the functions of organs of control, their practical methods of operation were developed. Experience since the very beginning of the war had demanded, along with the employment of communications equipment, the broad application in administration of personal contact with subordinates and an intensification of active organizational work by officers and generals among the troops, directly on the scene. This made it possible to examine thoroughly problems of troop coordination, to control the work of subordinates effectively, and to give them the assistance required in the control of troops.

To accelerate the collection of data on the rapidly changing situation, the assignment of missions to the troops and control of their fulfillment, it became necessary to expand the practice of sending staff officers with communications on two levels down, and to include subordinates in the net and monitor their conversation.

The proper organization of control posts was of great importance in improving the control of troops. In the first months of the war, field control of fronts and armies, as well as of soyedineniya, was often concentrated at one point, not divided into echelons, and was widely separated from the troops and lost touch with them. They were often subjected to enemy air and artillery attack and sustained great losses. To correct these faults and ensure uninterrupted contact with the troops, and to increase the viability and mobility of control points, required their echelonment in depth. The first echelon (command post) was situated as close as possible to the troops and provided direct control of combat operations, while the second echelon consisted of the rear control post and was designated to control the rear area. Observation of the progress of combat operations on main axes took on special importance in the attainment of flexibility and effective control. Therefore, at all levels up to the front, observation posts were organized, and sometimes forward control posts. On secondary axes, auxiliary control

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and alternate locations for control posts were also readied. The relocation of control posts during an operation or battle was usually accomplished by echelon. This extensive system of control posts justified itself fully. It ensured uninterrupted control of the troops during combat operations involving maneuver, and reduced losses of personnel of control organs to enemy fire attacks.

The resoluteness and intensity of combat operations brought increased importance to the moral and fighting qualities of command personnel, their courage, self-control, and ability to keep control of the troops and ensure their fulfillment of combat missions in a difficult situation. The acquisition of new combat equipment required that commanders and staffs have expert technical and general knowledge, and that they be constantly replaced.

The foregoing brief analysis of the development of the theory and practice of troop control in past wars establishes that, with the availability of new weapons in the armed forces, the increase in intensity, scale and maneuver in operations, and the changed organizational structure of combat forces, a basic trend in this development has been a continual increase in the volume of work demanded of commanders and staffs at all levels, along with a simultaneous decrease in the time available for its accomplishment. This inevitably complicated the over-all conditions of troop control and brought new, increased requirements for firmness, flexibility, continuity, and efficiency. These requirements found application in a continual review and definition of the control functions of the various command levels, redistribution of duties (but not responsibilities!) between commanders and staffs, improvement of the organizational structure of control organs and their methods and mode of operation, and the introduction of new technical devices into the control function.

Of special importance was the merger of the over-all governmental and the strategic leadership, which ensured more correct and complete consideration, in the supervision of the armed conflict, of the military-political situation, internal conditions of the adversaries, their economic and moral capabilities, the condition of the armed forces, and other conditions relating to the conduct of the war.

The role of the strategic command in the direct supervision of armed warfare is continuously growing. Its functions are expanding and extending increasingly into the respect to the planning, preparation and support of operations. The resolution of such questions is centralized in the commander in chief's headquarters to a greater degree as the scope of the operation is more decisive and significant

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and no more [illegible] are concentrated [illegible] to maintain a direct influence on the progress of combat operations, such headquarters are retaining under their own control increasing numbers of the most important weapons and material reserves.

On the operational level of supervision, on the one hand, there is a tendency to decide the most important questions of troop control, particularly questions relating to training and support of operations, in increasingly close contact with higher command levels. On the other hand, there is a tendency to expand control functions into questions of tactics. This is particularly apparent during the preparation of an operation, when, as time permits, the operational command decides many questions relating to the organization of combat operations.

During an operation it becomes necessary to extend great autonomy to commanders of tactical elements, particularly in the choice of methods of execution of assigned missions. Strict centralization of control under such conditions may adversely affect the success of combat operations.

As the power and range of weapons of destruction increase, the headquarters takes an increasing part in the direct control of them. The employment of these weapons becomes the function not only of the tactical command to which they usually were fully subordinated in the past, but also of the operational and strategic command. Experience in the employment of various weapons indicates that the greater their striking power, the more must their control be centralized; and the greater the range of the weapons, the higher must be the command level at which their employment is centralized.

By employing the most important destructive weapons the operational command is capable of directly achieving an operational success, without the tactical successes which ordinarily preceded it in the past. For example, during the Great Patriotic War massed air attacks were able to destroy counterattacking enemy forces, performing a mission which was necessary to the success of the operation as a whole.

The importance of countering enemy weapons of destruction has grown continuously. An example is the part played in the accomplishment of missions in operations of the last war by the countering of air forces. Special operations were even mounted to secure supremacy in the air. The organization of such countering efforts therefore takes an increasing role in the control of troops.

It must be pointed out that success in troop control, particularly in the initial period of a war, depends increasingly on the degree to which the theory and practice of troop control developed before the war

control [illegible] established system of control has been tested by experience in training and maneuvers, and meets modern requirements.

With the increased number of tasks performed by the command, the role of staffs in the control of troops is continuously increasing, the importance of providing technical equipment to control organs is growing, and further dispersion of control posts and improvement of their mobility is taking place. The organization of control posts in armored troops units (soyedineniya i ob"yedineniya) has been particularly instructive. These posts typically have had a small personnel complement and great mobility.

These are some of the complicating trends in the historical development of the theory and practice of troop control.

Under modern conditions, with the revolution in military affairs, these trends logically must be given further development and extension.

The availability to the armed forces of rocket and nuclear weapons, jet engines, and electronic computers, and the complete motorization and mechanization of troops, besides changing fundamentally the nature of armed conflict, operations and battles, have increased immeasurably the volume of troop control measures. It is sufficient to note that, in addition to measures performed in the past, it also includes such complex matters as organizing the employment of nuclear weapons and ensuring rapid exploitation of nuclear strikes by combined-arms units (soyedineniya i ob"yedineniya) of the ground troops; organizing antimissile defenses and the protection of troops and rear objectives against enemy weapons of mass destruction; predicting radiological, chemical and bacteriological conditions; organizing the movement of troops across areas of contamination and destruction, etc. Reaching decisions and planning operations now involves analysis of a great volume of data on the situation and performance of complex calculations.

Moreover, the time available for the preparation of operations, particularly in the initial period of a war, is considerably reduced. The so-called preparatory period of an operation as it was formerly understood in general can no longer exist. In the organization and conduct of combat operations, many problems of troop control must literally be solved on the move, in an extremely complex and quickly changing situation. Moreover, as a result of nuclear strikes control posts may be taken out of action in a short time and communications systems broken.

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Thus, troop control conditions are becoming increasingly complex and requirements for control are multiplying. Logically, all existing trends will receive further development from now on. Without discussing this question in detail in this article, we shall point out only the following conditions.

The decisive means of achieving the goals of modern war are rocket and nuclear weapons, with their unlimited effective range and tremendous destructive capabilities. This requires maximum centralization of control of the principal nuclear-rocket weapons in the Supreme Command, particularly in the initial period of the war, for here and only here is it possible to decide correctly and most effectively questions concerning the objectives of nuclear strikes, targets for destruction, the power of warheads and means for delivering them to the targets, the type of explosive effect and the time for delivery of strikes, and finally the issuing of orders or signal dispatches. Only here can the authority be placed for "pressing the button" to activate the principal weapons of war. The Supreme Command has thus become not only a directing organ of supervision, but also the immediate executor of the principal missions of the armed conflict.

The most important task of the General Staff in preparing for a modern war is the detailed planning of the employment of nuclear weapons by all branches of the armed forces.

The chief functions of the operational command have become the organization of exploitation of atomic strikes delivered under the plans of the Supreme Command, the employment of nuclear weapons of operational and tactical types, as well as the control of separate battles and engagements on a given axis or in a given area and their coordination and support. The independence of tactical-level commanders in the execution of assigned combat missions is increasing immeasurably. Unnecessary interference in the functions of subordinates inevitably leads to losses of time and to perfunctory decisions, and therefore is detrimental to the fulfillment of combat missions. Also to be considered is the fact that the sharp increase in the firepower of units (soyedineniya) and improvement in the level of training of command personnel on the tactical level greatly increase the possibilities for creative initiative on their part in the execution of combat missions.

The new conditions require that troop control posts be organized in a new manner. Considering the constant threat of their destruction by enemy atomic strikes and the dynamic character of combat operations, they must have a small personnel complement and be highly mobile and distributed over a great area. Each must be ready at any moment to

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assume control of troops from a higher or lower level in the event its posts are taken out of action. They must be provided with the latest in technical equipment for mechanization and automation of control processes, for only in this way can timely and adequately effective employment of the principal weapons of destruction be achieved.

Control organs themselves will be different. In many armies it is considered that the existence of a great number of independent control sections (chasti, otdely) under one control organ contradicts modern requirements, since such an organizational structure inevitably produces excessive levels of control and parallelism in operations and makes control organs unwieldy and immobile. Therefore a determined effort to improve the organization of control organs is under way in some armies. The basic trend is to the formation of a single staff, organized on the principle of a division of functions among groups and centers which are small in strength and equipped with modern technical means of control. Thus, the role of the staff in troop control is growing immeasurably.

More advanced working methods are also being sought for commanders and staffs. Special attention is being given to achieving a sharp increase in efficiency, primarily in the performance of such measures as the collection and analysis of data on the situation, the making of decisions and the assignment of missions to the troops.

High moral and fighting qualities in command personnel will have a decisive effect for the achievement of victory under the new conditions. It is readily seen that to maintain control of troops in nuclear-rocket war, to overcome fear and prevent panic following the first nuclear strikes and ensure fulfillment of combat missions, is possible only on the part of officers and generals of high ideals, who are infinitely devoted to the homeland, courageous, resolute, brave, strong-willed, composed, and sober-minded. Education of such personnel in these qualities is therefore receiving primary attention.

Training requirements for command personnel have been raised. For skillful supervision of troops equipped with complex new materiel, military leaders must have perfect knowledge of this equipment, in addition to the general principles of military science, and must know the fundamentals of physics, mathematics, chemistry, cybernetics, and radioelectronics. The problem of the engineer training of commanders is critical.

These, briefly set forth, are the trends in the development of troop control under modern conditions.

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A further major influence on troop control will obviously be exerted by proposals in foreign armies for equipping troops with small, superpowerful atomic and laser weapons, new rockets, and space devices; for the employment of complex equipment for automation of control and artificial earth satellites for signal communications; improvement in the air-transportability of troops and control posts, and the equipment of troops with new tanks, armored transports, and other combat vehicles.

All these devices will undoubtedly bring new changes in the character of combat operations, with increased intensity, scale, maneuver, and tempo. The number of control functions will increase and the time available for their accomplishment will decrease. Requirements for control and the level of training of command personnel will increase. It will be necessary to define the sphere of control of strategic, operational and tactical commands, to organize control posts in a new manner, and to improve the authorized structure of control organs and their methods of operation.

Our task is to observe attentively the development of military affairs, to give prompt attention to training results, and on this basis to develop continuously the theory and practice of troop control, which will promote the enhancement of the combat readiness of our Armed Forces.

THE LAWS OF ARMED CONFLICT ARE THE OBJECTIVE BASIS OF THE LEADERSHIP OF COMBAT OPERATIONS

by Col. M. POPOV

The combat operations of the armed forces of opposing sides are subject to their own objective laws, which play a very real role in the progress and outcome of a war. The classics of Marxism-Leninism frequently spoke about the existence of specific laws of war. Engels, in the article, "European War," wrote: "Military movements on sea and on land are subject not to the wishes and plans of diplomats, but to their own laws, which cannot be violated without subjecting the whole expedition to danger." Lenin, in the well-known work, "Counsels of a By-stander" called for "careful consideration" of those "Special laws" to which armed insurrection as a special form of political struggle is subject.

Just what are the objective laws of war? What is the relationship between their operation and the conscious actions of people; how can the laws of war be practically utilized by military leaders? These are the most important questions which come to the fore in the study of the laws of war, and particularly, the laws of armed conflict, which constitute the basic subject matter of Soviet military science.

The problems of the laws of war is actively studied in Soviet military literature on the basis of Marxist dialectics, which has found expression in a number of substantial works and in numerous articles in periodical literature. This makes it possible, based on what has already been achieved, to proceed to some generalizations of the relationship of the objective and subjective in armed conflict, of the operation of objective laws and the conscious, willful acts of officers and military leaders; it is to this that this article is mainly devoted.

Under modern conditions, the state of war involves the whole population of the combatant state. War changes the nature of the production processes of industry; to a great degree it subordinates to itself science and art; it has a strong effect on the political and morale condition of the population; it changes the established pattern of consuption; and it brings into being a specific form of the social activity of people--organized armed conflict. Therefore the laws of war are different from other laws of social development. This, of course, does not mean that during war the operation of all others ceases.

Wars arise as a consequence of economic and political contradictions between classes and states, and those laws of the class-antagonistic society, according to which these contradictions are formed and developed, may be attributed with certain reservations to the laws of the orgin of

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wars. The law of the unevenness of the economic and political development of the capitalist countries in the stage of imperialism may serve as an example of this. However, the system of laws of war is formed by those specific laws, inherent in this social phenomenon, which come into being along with the war and continue to operate throughout its duration.

Marxist-Leninist philosophy has generalized the most important distinguishing features of the laws of nature and social life. On this basis it has worked out the concept of law, which has a methodological importance of all sciences, including military science. Lenin gives a profound and accurate statement of the concept of law. In Philosophical Notebooks he writes: "Law is relationship...the relationship with essential realities and between such realities." This means that laws are connections and relations in the phenomena of nature and society wherein the connections and relations are the most important and essential. Laws are those connections and relations which inevitably under certain conditions produce a certain result. The development of various processes, both in nature and in social life, take place in conformity with the operation of laws.

Proceeding from this, we may say that the laws of war are the most essential connections, relations and dependencies in its phenomena, in the very essence of these phenomena. The operation of these laws appears as the objective basis, with relation to the actions of soldiers, officers and generals, for the attainment of victory, both in the war as a whole, and in individual engagements, battles and operations.

The laws of war, in our opinion, may be divided into two basic groups, conforming to the difference between war as a whole, and armed conflict. To the first of these belong the most esstential connections and relations in the phenomena of war, the very important dependence of its progress and outcome on the economies of the warring states, their social-political structure, the political condition and state of morale of the population and the army, the quantity and quality of their weapons, the level of development of science, and certain other factors. The founders of Marxism-Leninism revealed and thoroughly established the basis of this kind of dependence. Many works of our military theoreticians are devoted to the study of these laws. This group of laws shows the relation between armed conflict and those social-political, economic, and other conditions under which the war proceeds.

First among these laws is the very important inherent relationship between the political content of the war and the armed force employed in it, a relationship proceeding from the very essence of war as a social phenomenom.

War in its essence is both politics and armed struggle. The well-known thesis of Lenin states: "In application to war, the basic position

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of dialectics is that "war is simply the extension of politics by other" (namely violent) 'means.'" (Collected Works, Vol. 21, p. 194). In this definition distinctly apear two ideas, accurately corresponding to the two basic aspects of the essence of war. The first is: war is an extension of politics; the second: war is armed force. As an extension of politics, every war has its political content; as the use of force, war is armed conflict.

The political content of war is its political basis and direction, its social-political character in certain concrete historical conditions. The political content of a war is determined first of all by the following: of the politics of what class or state is it an extension; in the name of whose economic interests and for what social-political aims is it being waged; and to what historical results will victory or defeat of one side or the other lead?

Armed struggle, the basic group of laws of which we will speak about below, represents the totality of the military operations of the armed forces of the opposing sides.

The political content of war and the armed force in it are organically interconnected, inherently united and indissoluble. War is the mutually inter-permeating unity of political content and armed force. There cannot be a war without armed force. But also there is no war without political content. "War is politics through and through," wrote Lenin.

The inter-relationship of political content and armed force within a single whole--war--brings with it interaction between them, a certain kind of correlation between them. The political content of war and the armed force in it are of unequal importance, unequal status. Political content is primary and dicisive; armed struggle is secondary and subordinate, inasmuch as it is the means of politics.

The correlation between the political content of war, and armed force as a specific form in which this content is expressed, is the inherent, essential relationship of those aspects which in their totality constitute the essence of war, i.e., the most profound, inherent, essential relationship of the law of war. The essence of this law is expressed in the fact that the political content of war exercises a decisive influence on the general character of the armed struggle, on the methods and forms by which it is waged, and on the kinds of weapons used. In short, the political content of the war determines the nature of the armed force used in it.

The idea of this law is contained in a number of works of Lenin. For example, in remarks on Clausewitz's book, On War, Lenin noted that "the nature of the political goal" has a decisive influence on the

conduct of the war. The effect of this law permeates all the processes of the armed conflict, from the biggest strategic operations down to particular battles and the actions of each soldier. This law constitues the pivot around which revolves the operation of the other general laws of war and the laws of armed struggle.

The decisive effect of the political content of a war on the nature of the armed struggle is confirmed by the whole history of wars. Wars which have arisen out of minor political contradictions and have not been in pursuit of vital political goals have usually been carried on indecisively and at a slow pace. On the other hand, wars for decisive political goals have always been characterized by exceptionally intense military operations. World War II may serve as a convincing example of this; in its political content there were essential features which corresponded to the different nature of the armed struggle in the West, and on the Soviet-German front.

For example, in the initial period of the war, from September, 1939 to the spring of 1940, the allies did not carry on active military operations against the German-Fascist troops. And that at a time when 115 Anglo-French divisions faced a total of 23 German divisions. Military operations of the opposing sides were limited to sporadic exchanges of fire and flights of reconnaissance planes. Things reached such an absurd state that the French called this the "comic" or the "phony" war.

The strategy of the "phony" war was entirely determined at that time by the political content of the war of England and France against Hitler's Germany. The ruling circles of England and France still counted on directing the aggression of Fascist Germany to the East, against the Soviet Union. The governments of England and France gave Hitler to understand that he had complete freedom of action in the East, but would meet with resistance if he tried to start active military operations in the West.

But a completely different picture of military operations arose in the war of Germany against the Soviet Union: on the Soviet-German front there was no lull in the bitter fighting from the first to the last days of the war; the armed struggle was exceptionally intense. This corresponded to the political content of the war between a socialist country and a fascist state.

Thus the general character of the armed struggle is directly dependent on the political content of the war. The more decisive the political goals that are pursued in the war, the sharper, the more intense and bitter the armed struggle--this is one of the ways in which armed struggle is subject to law, and represents a manifestation of a basic law of war. Lenin particularly emphasized this effect of law: "The more deeply political war is, the more 'warlike' it is; the less deeply political, the more 'political' it is." (Remarks on Clausewit's work, On War, Collected Works, Vol. 38.)

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The operation of this law would undoubtedly be manifested in case of the unleashing by the imperialists of a new war. In such a war, absolutely opposing political goals would be pursued. The sharpness of the political contradictions, in combination with the special characteristics of nuclear-rocket weapons, would produce military operations of an exceptionally intense, fast-moving and decisive kind.

This law, to be considered a general law of war, is at the same time a law of armed struggle, because it expresses the influence of politics on armed force, and its effect permeates all the phenomena of armed struggle.

Another essential relationship which exercises great influence on the general character of the armed struggle and on the concrete methods of carrying it out is the connection between the methods of exercising armed force, on the one hand, and the characteristics of weapons, military equipment, and means of communication and transport on the other. Through armament economics exerts its influence on armed conflict. Engles wrote: "Nothing so much depends on economic conditions as the army and the navy. Armament, composition, organization, tactics and strategy depend primarily on the level of production and means of communication and transport attained at a given time." (Selected Military Works, Voyenizdat, 1956, p. 11)

In the era when the use of gunpowder was unknown, armed conflict usually took place as engagements between comparatively small masses of troops. The battle began with the use of metal weapons, but then almost always developed into hand-to-hand fighting. The outcome of the fight was decided by a stroke of a sword or thrust of a spear. This was one of the laws of armed conflict of that period.

There was a complete revolution in waging armed conflict with the appearance of firearms and wide-spread equipping of troops with them. The firearm gradually replaced "cold steel." There arose a new law of armed conflict: the course and outcome of the battle was decided basically by the firepower of each side.

The appearance of nuclear-rocket weapons and the further development of modern military eqipment and means of communication and transport have produced completely new qualitative changes in the nature of armed conflict, in the methods and forms by which it is carried out. The most important features of nuclear-rocket weapons are its great range, the high speed of movement to the target, and its unprecedented destructive power. The use of nuclear-rocket weapons will change the whole picture of armed conflict. Military operations will become extraordinarily intensive, fast-moving and of brief duration. Marshal R. Ya. Malinovskiy, Minister of Defense USSR, said at the 22nd Party Congress: "In a future war, nuclear-rocket weapons will have a decisive role." This refers, another fact, that in case of

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tional weapons which has been reached, there will come into being a new law of armed conflict: the course and outcome of the battle will be decided by the blows of nuclear weapons. Final victory in the armed conflict will be achieved by the combined efforts of all types of armed forces, with the strategic rocket troops playing the decisive role.

All this shows convincingly enought that between the characteristics of weapons and military equipment, on the one hand, and the nature of the armed conflict, on the other, there exists a very essential connection, a relationship which can be reduced to a law. The decisive influence of armaments on the nature and the methods of carrying out of armed conflict is confirmed by the centuries-old history of wars, and consequently is to be understood as universal and inevitable, which provides the basis for considering this essential relationship as one of the laws of war--the law of the dependence of the nature of the armed conflict, and the methods by which, and forms in which, it is carried out, on the characteristics of weapons and military equipment. From this point of view, this law, among several others, appears as that which decides the development and change of methods of waging war. The afore-mentioned ways in which armed conflict conforms to law represent nothing other than an expression and manifestation of this law in concrete historical conditions of a certain, which permits us to conclude that the conformity ot law of armed conflict is not identical with its laws, although it is inseparable from them.

The ways in which armed conflict conforms to law are the phenomena, processes and tendencies which are the most typical, repetitive, important and characteristic of it. These are those phenomena in which is clearly perceived their conformity to law, their subjection to the operation of a law or laws. The conformity of armed struggle to law is objective, since its basis is the operation of objective laws; in this connection, study of the ways in which armed struggle conforms to law is a way to the understanding of the laws themselves.

The two laws considered, of course, do not exhaust the first group of laws of war, but they are, in our view, the most important.

The second group of laws, it seems to us, includes the laws of armed conflict itself. These are the laws of military operations on a strategic, operational, and tactical scale, and the laws of combat operations of various kinds of troops and armed forces. It should be emphasized that there is no aboslute boundary between the laws of war as a whole and those of armed conflict. Each law of war is more or less a law of armed conflict, and each law of armed conflict is more or less a law of war as a whole. Still, there is a difference between to two. We will try to expalin, at least in very general outlines, the laws of strictly armed conflict.

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The characteristics of weapons and military equipment have a decisive effect on the general nature of armed conflict and cause to arise certain methods and forms of combat operations and thus influence the course and outcome of engagements and battles. However, this law still does not give a complete answer to the question: on what depends, what determines, victory by one side or the other in armed conflict?

Every war is one or a combination of several, strategic campaigns, consisting usually of a number of operations, which in turn are broken down into numerous battles and engagements. Each engagement, battle and operation has certain bounds in time and space, takes place within certain limits as an independent process. In any battle or operation from each side there take part a certain number of troops of a certain kind. Although a great number of objective and subjective circumstances affect the course and outcome of every engagement, battle and operation, of decisive importance is the quantitative and qualitative correlation of the material and spiritual forces of the troops which participate directly in a given action of armed conflict--that is, their combat power.

The combat power of military units, large and small, is determined not only by the quantity of men, weapons and military eqipment, but also by their qualitative condition, the morale of the personnel, the combat experience, level of military knowledge, and the military and technical skill of the men and officers. Each of these is a relatively independent factor, but none of them is of absolute, self-sufficing importance. All of them are interrelated and supplement one another, and as a unified whole make up the combat power of the unit, of whatever size. The influence of each of these factors on the development of engagements, battles and operations--these are law-governed relationships which manifest a more general, essential relation in the processes of war--the law of the dependence of the course and outcome of armed conflict on the combat power of the troops of the opposing sides.

The question may arise: in armed conflict as a whole, and in individual battles, is only the strongest bound to win? No, not necessarily, if by the strongest is simply meant the side which has the initial quantitative and qualitative superiority of forces. Although armed conflict is indeed a process of measuring forces against each other, this measurement is not mechanical. A battle is not a set of scales, on which the side bearing the heavier load invariably shifts the balance in its favor. A battle is the action of people, possessing consciousness and will. They actively wage armed struggle; its course and outcome primarily and mainly depend on their actions. The side having the greater fighting power will indeed gain the victory if other factors do not enter in. But if the command of this side relaxes its attention, permits mistakes, and makes incorrect decisions, then the battle may end in defeat for it. The weaker side, by maneuvering its forces and material, may

defeat the superior forces of the enemy unit by unit, each time opposing him with greater military skill, better organization, and greater fighting power by the aggregate of its forces.

So far as the course and outcome of a battle or a campaign is objectively dependent on the relation between the combat power of the armed forces of the opposing sides, each of them will try to secure for itself superiority in this. History has innumerable examples confirming this. For example, starting World War II, Germany rushed into Poland 57 divisions and two brigades, 2,500 tanks, and 2,000 airplanes. Poland was able to raise only 33 divisions, 771 planes and a small number of tanks of obsolete design. Germany had almost double superiority in manpower and many time the superiority in tanks and planes. Therefore, despite the heroic resistance of many units of the Polish army, Fascist Germany in a short time defeated the Polish armed forces and seized the territory of Poland.

In a nuclear-rocket war, will the law of the dependence of the course and outcome of engagements, battles and operations on relative combat power of the opposing sides continue to operate? In our opinion it will, because the attainment of success in battle in the nuclear war, too, requires the securing of superiority of forces over the enemy. The warring sides will each strive to surpass the other in the power of nuclear strikes. The use of nuclear-rocket weapons will increase the contradiction between the tendency to concentrate troops and the tendency to disperse them. The first is called for mainly by the law of the dependence of the course and outcome of the battle on the relative combat power of the troops, inasmuch as the attainment of superiority in combat power over the enemy is provided in certain circumstances primarily by the concentration of superior forces. The tendency toward dispersal arises mainly from the danger of destruction of troops concentrated in a relatively small area by the nuclear weapons of the enemy.

In this connection, we may anticipate that the usual situation of troops will be that of dispersal. In certain regions and in certain directions troops will be concentrated, but within such limits of time and space as not to become a suitable target for destruction by nuclear weapons. During military operations, to carry out a certain strategic, operational or tactical mission, troops may be forced to concentrate, according to a previously wored-out plan and for the shortest possible period.

From dispersal of armed forces to their concentration for carrying on a battle, and from this back to dispersal again--this is one of the features subject to law of nuclear-rocket war, connected with the operation of the law of the dependence of the course of armed conflict on the relative combat power of the troops of the opposing sides.

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laws of armed conflict.

In wars of maneuver there is wide-spread occurrence of meeting engagements. They arise from various causes: in one case the opposing troops encounter each other when both are conducting an offensive, or they come into contact when each is moving up from depth to meet the other and they are forced to enter into battle directly from the march. In another case a meeting engagement arises from the attack of one side and the attempts of the other to stop this attack by counter-attacks from depth. Sometimes one of the opponents plans in advance on entering into a meeting engagement and prepares for this accordingly. Forestalling the other side in the deployment of troops and beginning combat operations in a meeting engagement gives great advantage to the side which is able to accomplish this. That is just how it was at the time fo the great tank meeting engagement of World War II at Prokhorovka, 12 July 1943, and likewise in the meeting engagement of the 3rd Guards Tank Army against the 2nd and 4th Tank Armies of the enemy in the Kiev offensive operation of 1944, in that of the 4th Tank Army with the tank group of the enemy in the L'vov-Sandomir operation of 1944, and several others.

The same thing must be said of other forms of combat operations of troops. In any battle, forstalling the enemy in the deployment of troops and carrying out combat operations against the enemy is one of the very important, and frequently the decisive factor for victory. This is confirmed by many generally-known operations of World War II. Inasmuch as this relationship is constantly repeated and exercises a strong influence on the course and outcome of various kinds of combat operations of troops, it should be regarded as one of the laws of armed conflict. It may be formulated as follows: In any engagement, battle or operation the relative advantage is gained by that of the opposing sides which is able to deploy its troops and begin combat operations ahead of the enemy. This law constitutes the objective basis of the principle of surprise.

This law is manifested with any correlation of forces. Of course, like other laws of armed conflict, it cannot be considered the only law which provides for victory. The relativity of the advantage obtained means that the troops which have forstalled the enemy in the deployment of forces and initiation of combat operations will not necessarily have absolute superiority of forces over the enemy; they will only gain a certain addition to their potential combat power. Whether this is enough for the attainment of victory is another matter.

The law of the dependence of the course and outcome fo engagement, battles and operations on forestalling the enemy in deployment of troops and beginning combat operations, clearly manifested in World War II, will play a great role in a nuclear-rocket war. The use of nuclear-rocket will create favorable conditions for mutual penetration into the operational

formation and combat formations of troops, which will enevitably bring about numerous meeting encounters, in which will participate not only mechanized and tank troops, but also helicopters, and paratroop chasti and podrazdeleniya. The great number of meeting engagements and battles and, possibly, meeting operations will have a substantial effect on the course and outcome of a war employing nuclear-rocket weapons, which will increase the significance of this law in a future war.

Two important conclusions follow from the elucidation of the content of the laws of armed conflict. First, these laws represent the usual, most frequently encountered, but, at the same time, exceptionally important connections and relations in the combat operations of troops, which go along with the extraordinary complexity and variety of the manifestion of the laws of armed conflict in the unique conditions of each engagement, battle, and operation. From this arises also the complexity of directing the combat operations of troops. Second, inasmuch as armed conflict is a single, two-sided process, the laws of this process distribute their effect equally on the troops of both the combatant sides. However, the results of the operation of these laws, their manifestion in the form of certain law-governed factors, and the ways of utilizing them may be for the two sides not only different, but even directly opposite. This by no menas repudiates the special laws of the development of the amred forces of states with different social-political systems.

The process of armed conflict, subject to objective laws, does not exclude freedom of decision and action by military commanders. In turn, these actions of theirs appear as the result of recognized objective necessity. Here the decisions of commanders and the operations of troops are not simply the consequence of subjection to laws. Military commanders exercise an active effect on the direction, strength, and circumstances of the operation of these laws. In this lied skill in basing their actions on the laws of armed conflict.

How is this attained in practical combat operations? We know that all social laws operate only with the existence of certain conditions. The laws of armed conflict are no exception to this. They operate only when the necessary conditions exist. If certain conditions are lacking, the lacking, too, are the essential relations between them, i.e., the laws of armed conflist. The conditions of armed conflict are objective in nature. This means that they exist independently of the consciousness of people, their will and desires. But it by no means follows from this that officers and military commanders can have no influence on them. Lenin remarked: "The world does not satisfy man, and man by his actions decides to change it." (Collected Works, Vol 38, p. 205)

In wars of the remote past there existed comparatively limited possibilities for changing the objective conditions of combat operations

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of troops. As weapons and military equipment were developed and perfected, these possibilities correspondingly increased. The most recent and obvious example of this is the combat activities of our commanders in World War II.

In the culminating campaign of the war it was proposed to launch the main attack toward Berlin with the forces of the First and Second Belorrussian and the First Ukrainian Front in the Ostrolenko-Krakow sector, extending up to 600 km. Here the Germans had 37 infantry and 11 tank andmotorized divisions, and 7 brigades. The presence of such large forces in this direction was a serious obstacle to execution of the conceived plan. In order to create more favorable possibilities for the offensive in the direction of the main blow, the Soviet command decided to weaken the German-Fascist forces defending the central sector of the Soviet-German front. Special operations were undertaken for invasion of East Prussia and in the Budapest direction, thanks to which considerable forces of Germans were successfully diverted to the flanks of the strategic front. From October to December 1944 the German command transferred 18 divisions and several brigades from the central sector of the front to reinforce the flanks. Thus was created favorable objective conditions for carrying out the planned strategic operation, meeting the requirements of the law of the dependence of the course and outcome of armed conflict on the relationship between the combat power of the troops of the opposing sides. In January 1945 our troops succeeded in breaking through the German defense in the direction of the main blow, and, developing their gains in depth, by the end of January had reached the Oder and seized a base of operations on its left bank.

With the development of nuclear-rocket weapons, there has arisen the possibility of a rapid and fundamental change in the conditions of the conduct of war as a whole, as well as of individual engagements, battles, and operations. Therefore, in case the imperialists unleash a nuclear-rocket war, this form of the utilization of the laws of armed conflict will find the widest application.

But this is not the only way for the opposing sides to use the laws of armed conflict in their own interests. A change in the conditions of the operation of the laws of armed conflict precedes this operation and to a certain extent anticipates its result. Another form of utilizing the laws of armed conflict is the deliberate choise by military commanders of one of the many possibilities arising in certain conditions of the combat operations of troops.

In the course of armed conflict, the officers and military commanders evaluate the situation which has developed, elucidate the trends of development of combat operations, and make decisions; that is, they consciously select those alternatives the carrying out of

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which will best serve the accomplishment of their assigned mission. The essence of this process is that the possibilities, brought into being by the various laws of armed conflict, are constantly changing, depending on change in conditions, on the operations of the opponents and their troops. The decisions of officers and military commanders must change accordingly.

In battle, commanders visually ascertain what kind of their actions are successful, and develop them in this direction, trying at the same time to avoid such actions as are not successful and which make worse the situation of the troops entrusted to them. Thereby they are groping for that direction in which their actions as troop-leaders will most completely conform to the laws of armed conflict.

Armed conflict is a process wherein there constantly arises and is resolved the contradiction between the objective and the subjective, between the operation of laws and the conscious activity of people. The typical forms of the resolution of this contradiction and of the most characteristic conditions of armed conflict find their expression in principles of military art. The principles of military art have a "dual" nature. As an expression of objective necessity they appear as obligatory norms which the commander must take into account. As an expression of subjective principles, they grant the commander freedom of creation and initiative within the limits of the existing situation and practical possibilities of changes in it. This means that the principles of military art are the embodiment of the solution of the problem of necessity and freedom in armed conflict. The principles of military art are the most general, basic and guiding ideas concerning the methods of combat operations of troops for the purpose of attaining success in armed conflict.

The dependence of the content of the principles of military art on the laws of armed conflict is evidenced by the fact that these laws have always been, and remain, the objective basis of the leadership of the combat operations of troops. Only by means of deep and comprehensive understanding of the laws of armed conflict, which includes knowledge of their essence, content, manifestation, nature of operation, and forms of utilization in military operations, can we achieve a real unity of military theory and combat practice.

PROBLEMS OF MODERN COMBINED-ARMS COMBAT

Comment by Col M. FEDULOV

Urgent problems deserving careful consideration, study, thorough analysis, and broad discussion were presented in Maj Gen V. REZNICHENKO's article (Voyennaya Mysl', No 3, 1964).

That the author examined the conduct of combined-arms combat in various conditions of a situation is commendable. As a matter of fact, in waging continuous combat operations for several days troops will have to break through the enemy's prepared and hastily assumed defense, force numerous water barriers, pursue his retreating chasti, temporarily assume the defense, etc. The same podrazdeleniya and chasti will perhaps have to fight a battle both when nuclear weapons are reciprocally employed by the sides and in some cases when they are not. Fighting a battle without the employment of nuclear weapons may be a frequent occurrence for troops operating in directions of secondary efforts and in theaters of military operations.

In our opinion, the author correctly examined all these problems as a whole. Until now, as is known, questions on the organization and conduct of combat were examined with respect to one condition of a situation -- for example, to the employment or non-employment of nuclear weapons by the sides. There were, therefore, two sort of independent groups of theoretical positions. We feel that the author's merit consists in that he tried for the first time to bring to light both the general rules for conducting combat operations in various conditions and their distinguishing characteristics. We consider such an approach to the study of the problems under consideration most expedient.

At the same time, however, we cannot agree completely with all the author's statements. First of all, the statement that "unilateral employment of nuclear weapons is usually associated with definite miscalculations by the other side in the practical use of nuclear weapons" (page 21) arouses objection. This is not quite so. Even with an ample supply of nuclear ammunition each of the sides will try to use them in mass, primarily on the axis of the main attack. For example, according to the views of military specialists of the Federal Republic of Germany, on the axis of the main attack it is advisable to create a zone of complete destruction covering the entire region of disposition of the enemy grouping and extending to the depth of the line at the ultimate goal of the offensive operation. (Wehrkunde, March 1959)

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This is recommended in order to create the most advantageous conditions for friendly troops to quickly rout the main enemy grouping. Such a distribution of nuclear ammunition is probable when it is in short supply.

Since the nuclear weapons will not suffice for the entire axis selected for the attack under this use, the command of a given side may consciously procede on the basis that on the axes of secondary efforts troops will resolve combat missions using only conventional weapons. If necessary, nuclear weapons can always be employed here, too, in the course of the battle.

Also, it should not be forgotten that the the present time the armies of by no means all countries possess nuclear weapons.

Judging from the statements of foreign authors, as the article pointed out, in the course of combat operations the employment of small-scale nuclear weapons is possible. We are not inclined to belittle the significance of this weapon at all or to disclaim in general the possibility of its use by the sides of modern combat. Actually, this weapon permits destruction of the smallest, yet important targets located in the immediate virinity of friendly troops, and significantly encourages the troops to more successful fulfillment of their missions, both on offense and in defense.

However, it seems to us that this weapon can not always be used in combat, nor can it be used by all troops of the sides. These weapons at one moment of the battle or another may prove to be unready -- for example, if the already spent nuclear ammunition, etc. cannot be replenished in good time.

In this connection almost all the weapons capable of using small caliber nuclear ammunition already present or coming into the armament of the US Army can also use conventional ammunition.

The author correctly pointed out that the attack from the march is considered the main method of offensive troop operations when nuclear weapons are employed. But will this be the main method of troop operations when nuclear weapons are not employed? If discussing an attack against an enemy who has hastily assumed the defense, the answer to this question is affirmative.

As a rule, the hastily assumed defense was penetrated by troops attacking from the march even during the last war, and this method will be even more characteristic in modern conditions.

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As far as the prepared defense is concerned, overcoming it, depending on the situation, can now be accomplished either from the march or after limited preparation. Assumption of the offense from direct contact with the enemy, as was previously done, must obviously be considered untypical. This can be accomplished only in those cases when the troops have to temporarily assume the defense in the course of the offense, and then, after repulsing the enemy, resume the attack. Moreover, it is possible that assumption of the offense from the march will not succeed if the defense has been inadequately neutralized, and the troops will have to organize the attack again.

To negotiate the breakthrough of a prepared defense without using nuclear weapons requires the concentration of more artillery and support aircraft, powerful fire (artillery and aircraft) preparation, and support and escort for the attacking troops. In the defense, in these conditions, the role and significance of counterpreparation and such types of fire as rolling and standing barrage, convergent fire, etc. have apparently been fully preserved.

Solutions to the problem of selecting the axis for the main attack in the offense and for the concentration of manpower and equipment, about which the article said nothing, will be varied, in our viewpoint, depending on the availability and use of nuclear weapons. When nuclear weapons are employed, it is usually considered expedient to use them against reinforced strong points, groupings of troops, and other important targets. For example, The US press expresses the rather definite opinion than an army equipped with nuclear warheads does not need to hunt out the enemy's weak spot for an attack, but can strike directly on his main forces. Along these same lines, it is recommended that the main efforts of combined-arms soyedineniya and chasti (not necessarily superior) be concentrated for maximum exploitation of the nuclear strikes.

When conducting an attack without the employment of nuclear weapons the attacking force will obviously try to select the axis of the main attack in those regions which prove to be the weakest points in the enemy's defense, since fewer weapons will be required to neutralize the defense in this axis, and it will be easier to gain superiority in forces, which, it must be assumed, will become a necessity in these conditions.

Variances in concentrating the main efforts of troops in the defense are also inevitable. When nuclear weapons are employed they are more often concentrated in the depth of the defense, as is known. Take as an example the mobile defense of the US Army which is recommended when nuclear weapons are used. In this defense is considered expedient to have only a minimum amount of manpower and equipment in the first echelon. The greatest portion is concentrated in the depth of the defense. Together

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with this, modern viewpoints on the defense widely heralded in the pages of the US military press completely repudiate the creation of strict lines of resistance for holding terrain at any cost, as was done in the past. (T. Mataksis and S. Goldberg, Pentomicheskaya diviziya (The Pentomic Division), Foreign Literature Publishing House, 1959, page 211)

The author, in our opinion, correctly stated that based on possible conditions for conducting combat operations and the availability of nuclear weapons the substance of the missions of troops may be widely varied. But he did not elaborate on this in the article. Nuclear weapons permit inflicting such destruction on the enemy that the attacking troops can complete his rout by operating at high tempo and in great depth. The most important mission of troops in the course of the offensive and the defensive will be destruction of the enemy's nuclear weapons. With the use of only conventional weapons, the possibilities of defeating the enemy will become fewer and the depth of the missions of the troops, naturally, will decrease. Destruction of the enemy lies completely on the podrazdeleniya and chasti and their weapons.

In conclusion we would like to emphasize that in conducting combat operations using only conventional weapons there is the constant possibility and threat of nuclear weapons being employed by the enemy. Therefore, the readiness of troops to continue executing their missions under surprise attack and to quickly exercise measures of defense is a constant requirement regardless of the combat conditions.

Comment by Col M. SHMELEV and Col A. SINYAYEV

In the article under discussion Maj Gen V. REZNICHENKO raised a number of urgent questions associated with the solution of problems of modern combined-arms combat. His recommendations on methods of destroying the enemy in battle arouse special interest. We fully agree with the author that these methods will be varied each time, depending on the specific conditions for conducting the conducting the combat operations.

The most advantageous conditions for destroying the enemy, naturally, will exist when the troops have nuclear weapons. However, the troops have to be ready for action even when nuclear weapons are used by only one side or are not used at all. In these conditions it will be necessary to search for other methods of destroying the enemy. This will have an important effect on the methods of conducting the battle as a whole.

Examining this question, however, the author for some reason or another limited himself to the offensive alone and almost entirely avoided the defensive battle. Whereas in conditions of nuclear war, particularly on a tactical scale, the defense, as is known, is not always repudiated, it

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will undoubtedly be used and conducted within the limits of podrazdeleniya, chasti, and soyedineniya, and in certain cases by part of the forces or by all the forces of operational ob"yedineniya.

Both the defense and the offense are characterized by widely varied conditions of organization and conduct, which the article discussed. But it seems to us that the defending troops will more often have to fight a battle with a limited supply or an evident shortage of nuclear weapons or ammunition.

We feel that these conditions will occur far more often than will complete lack of nuclear ammunition by one side, and the author should have taken them into account. For example, assumption of the defense when the sides have a parity of nuclear weapons should not be ruled out in general, but it should not be considered typical. This is explained by the fact that the availability of an ample supply of nuclear weapons for the troops, in any case no fewer than the enemy has, not only permits, but urgently requires conducting decisive offensive actions, exploiting the nuclear strikes.

Both sides cannot attack in the same axis simultaneously. Here either the front will be stabilized for a certain length of time (which apparently cannot be considered typical nowadays), or one side, inferior in the amount of and the effectiveness of nuclear weapons, will have to cease the attack and assume the defense or even begin the withdrawal.

Hence, it is evident that defeat of the attacking troops by the defending troops is very difficult. Destruction of the attacking troops' nuclear weapons in order to deprive him of the superiority, thereby creating the most advantageous conditions for breaking up the attack being readied or which has already begun, is undoubtedly the main thing.

Having a limited supply of, and in a number of cases a definite shortage of nuclear weapons, the defending troops must use them particularly economically, only on the most dangerous and reliably reconnoitered targets. In these conditions the necessity of bringing in nuclear weapons from echelons and adjacent units to aid the defending troops has not been ruled out.

Conventional or non-nuclear weapons, particularly artillery and tanks, will be called upon to play the chief role in defeating the attacking force in these conditions. The entire burden of the struggle against the attacking enemy will lie on them. Support aircraft employing conventional ammunition (taking into consideration the enemy's possession of a large number of mobile targets) will acquire no less significant role.

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The author, for some reason or other, did not mention the significance of the struggle against enemy reconnaissance or against his means of control and guidance in order to complicate his employment of nuclear weapons in every way. This applies particularly to the defense battle, when the attacking enemy will have a superiority in nuclear weapons. In addition, both the attacking and especially the defending troops must widely use various camouflage measures and exploit the terrain's advantageous characteristics for defense against enemy nuclear weapons.

While speaking about the defense, in our opinion, it should be emphasized that the main efforts of the defending troops must be aimed at the destruction of the attacking force, chiefly enemy tank chasti, causing him the greatest possible losses not only by fire, but also by counterattacks following nuclear strikes.

Barriers are especially important in modern combat. Explosive mine fields, as is known, played an important role in World War II. In modern conditions of highly maneuvering combat actions quick and skillful defensive emplacement of engineering obstacles in the axis of the enemy attack, for example, can be a very effective measure, particularly when the defending troops suffer losses from nuclear strikes of the attacking force in this axis, causing gaps in their formations, and when shifting reserves here or concentrating the necessary density of fire in a short period of time is not possible. It is also necessary to set up engineering obstacles when the attacking tank chasti are driving a wedge into the defense.

Just as before, in the course of the offensive, obstacles, when installed in good time, can play an important role on the axes of counterattacks and counterstrikes of the defending force. These obstacles will be more effective if they are used in combination with all types of fire, chiefly antitank fire and aircraft operations.

Also, in modern conditions it might be advantageous to deliberately create zones of destruction and radioactive contamination of the terrain by inflicting nuclear strikes on targets with ground explosions on the axes of the enemy's most active operations. These, too, should be considered as barriers which might prove to be significantly more effective than conventional mine fields.

According to the views of foreign authors, a new problem, the solution of which will hold a prominent place in modern combined-arms combat, is the employment by each side of small-scale nuclear weapons and the destruction of enemy weapons of this type. Small-scale nuclear weapons are considered one of the chief means of destruction within the limits of combat. This weapon absolutely encourages heightened tempo in the attack inasmuch as podrazdeleniya and chasti have the possibility of destroying on a more operational scale the most important, including small-scale, enemy targets located in the immediate vicinity without risk of destroying friendly troops.

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will be able to operate more successfully. In particular, they will be able to exploit the nuclear strikes, advancing directly behind them in approach march formations and even in march formations.

As for the defense, employment of small-scale nuclear weapons in it, particularly against attacking tank chasti and podrazdeleniya will undoubtedly have a positive effect on the success of the defending troops' battle, even when the attacking troops have a general superiority in nuclear weapons.

Examining the problems of modern combined-arms combat, the author for some reason or other omitted such an important problem as the conduct of combat operations when the terrain has been seriously damaged and has a high level of radioactive contamination. Beyond doubt the radiation situation, being a part of the overall combat situation, completely affects the nature and methods of conducting both the offense and the defense. Therefore, each side will obviously try to analyze the radiation situation and take it into consideration when determining the axes of operations of podrazdeleniya and chasti, the sequence of suing nuclear and voncentional weapons, etc. There is also a need to solve such new problems for modern combat as negotiating or by-passing regions where the terrain is seriously damaged and is radioactively contaminated, and also, as we already pointed out, to specifically create such regions in the interests of the operations of friendly troops.

It should be noted that if the methods of negotiating and by-passing contaminated regions and troop operations on contaminated terrain have on the whole been rather widely discussed in the military press recently, then, in our viewpoint, the creation of damaged and contaminated terrain has not yet been given enough attention. Also, in the course of a battle conditions could so develop that these steps will prove to be profitable and play an important role in achieving success. In the offensive, for example, this might be used on those axes where the defending forces' lagre reserves are being moved up, if for some reason or other it has not been possible to rout them with nuclear weapons earlier; and in the defense on those axes where the attacking force has concentrated its main efforts and it is very difficult to repulse it with available weapons. In all types of combat, contamination of regions of the terrain might be favorable for covering the flank of friendly forces, etc.

True, expending nuclear ammunition just to contaminate regions of the terrain can hardly be recognized as the best way of using nuclear weapons. Each side will evidently try to deliver nuclear strikes on definite enemy targets while at the same time setting off a certain number of ground explosions, thereby damaging and radioactively contaminating the regions in passing. This must be done so that the contaminated terrain does not become an obstacle for the operations of friendly troops.

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The author's statements on the structuring of combat formations are not quite understandable. In his opinion, the division of combat formations are into such elements as the first and second echelon when the troops operate on separate axes will no longer reflect the nature of the grouping being formed. But, after all, it cannot be denied that even today in all conditions first and second echelons might be present, and not only when the sides do not employ nuclear weapons in the battle, as the author asserted. When there is no second echelon, regardless of whether or not nuclear weapons are employed, a combined-arms reserve will be created.

Consequently, the disposition of manpower and equipment in depth according to echelons will apparently be maintained even today. As far as the distribution of manpower and equipment is concerned, this will in fact be new when structuring combat formations. However, to contrast it to echelonment of troops, as the author did is hardly correct.

As distinguished from the past, today the troops of sides, both on the offensive and the defensive, will operate not in a solid front, but on axes by separate groupings, each of which, being a podrazdeleniye or chast', can have first and second echelons, or in place of the latter a reserve, within the limits of the battle. A grouping of troops of a higher echelon in this condition will have a first echelon operating on several axes and a general second echelon or reserve. Thus, in our opinion, echelonment of troops in modern combat is conceivable.

We also believe that the author was wrong in stating that all missions of the second echelon can be assigned to the reserves when the combat formation is structured into a single echelon. The second echelon and the reserve are not one and the same. They differ chiefly in their functions and the missions assigned to them and, based on this, in their strengths and composition. If a given reserve has the missions of the second echelon, and this could be, and the appropriate composition, then it will actually be the second echelon, no matter what it is called. The crux is not in the names of the elements of a combat formation, but in the nature of the problem.

Examining the problem of increasing the tempo of the attack, the author correctly spoke of the necessity of attacking from the march, as far as possible in approach march formations, and even in march formations (exploiting the nuclear strikes), during which advancement of chasti and podrazdeleniya at maximum speeds is achieved. Unquestionably, the attacking side will try to avoid the methodical attack in its primary sense and will take all measures to avoid being drawn into combat by broadly maneuvering on the battle field with fire, manpower and equipment while exploiting gaps and breaches in the combat formations of the defending forces, and by by-passing surviving centers of resistance, and as fast as possible penetrate the depth and develop success at high tempos, exploiting their nuclear and fire strikes.

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The author does not mention the fact that when the defending force sustains severe losses the possibility of emergency withdrawal of his troops has not been ruled out. In addition, the possibility of deliberate withdrawal of troops in order to encounter the attacking force at previously prepared lines in the depth in an organized manner may have a place.

Since the employment of nuclear weapons will lead to more frequent withdrawal of enemy troops than previously, pursuit will have an even greater place in modern combat. It may often arise not only in the course of the development of the offensive, but also in its very beginning as a result of effectively delivered first nuclear strikes, and when the outcome of the meeting engagement is unsuccessful for the enemy. We would also like to point out that pursuit is modern combat (within the limits of tactics) will acquire the characteristic of being conducted by tanks and motorized rifle troops in combination with the employment of nuclear weapons. Therefore, the mission of pursuing troops is not limited to destruction of withdrawing enemy groupings, but will frequently envisage attainment of the ultimate goal of the battle in the fastest possible time.

We feel it would have been advisable to give a greater place in the article to problems of the organization and conduct of reconnaissance in modern combat. The author limited himself to the requirements made on reconnaissance in the interests of nuclear and fire destruction of the enemy. But reconnaissance cannot be limited merely to disclosure of enemy targets for destruction by nuclear and conventional weapons. It is enough to say that a great significance will be played by radiation reconnaissance, determination of the results of nuclear strikes inflicted on the enemy, and disclosure of enemy plans, the operational directions of his troops, etc. Also, conducting reconnaisance in the interests of each branch of the service is necessary.

High maneuverability in modern combat demands skillful coordination of reconnaissance efforts, distribution of missions between reconnaissance resources in accordance with their capabilities and the nature of the enemy target, and also continuous firm control of reconnaissance. It should also be taken into consideration that reconnaissance manpower and equipment can suffer significant losses, which is why augmentation of reconnaissance in the course of the battle in one of another directions is required. It is necessary to have a reserve in reconnaissance manpower and equipment for this.

When the battle is conducted without the employment of nuclear weapons by the sides, reconnaissance will be organized and conducted first of all in the interests of execution of the missions of grounds forces podrazdeleniya and chasti.

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In conclusion we would like to turn attention to the independent operations of podrazdeleniya, chasti, and soyedineniya when they are cut off from other attacking troops. These operations in the past war were conducted by mobile front and army troops and mobile forward detachements. It seems to us that studying the positive experience of the operations of these troops would be extremely useful. It should be considered in regard to this that in modern combat, due to its high dynamics and inequiality of development, these operations will apparently be even more frequent phenomena and will occur in a more complex situation.

Comment of Col N. LYUTOV

Maj Gen V. REZNICHENKO for the first time examined jointly the fundamental characteristics of preparing for and conducting combined-arms combat when nuclear weapons are employed by one or both sides, and when they are not used. This new view of the problem has caused a lively exchange of opinions.

Some of the author's recommendations, however, were insufficiently founded and not quite clearly stated, and therefore need to be elaborated, particularly his statements on the most characteristic conditions of unilateral employment of nuclear weapons in combat; the statement that if the sides use small-scall nuclear weapons, the role of close combat increases; the question of centralized and decentralized use of conventional fire weapons; the question of the new principle of structuring combat formations; and the question of transferring the greater part of the work in organizing cooperation "from the period of preparing for the battle to its dynamics." A number of very important problems of modern combined-arms combat were also omitted in the article. Some of these we would like to examine briefly.

For example, it seems to us that merely one superficial mention of surprise, as the author did, is not enough. The role of surprise in modern warfare has grown so much that it must be discussed as one of the most important principles and conditions ensuring the attainment of success in combat. Historical experience shows how important surprise is in combat, making it possible to rout the opposing enemy grouping with equal or even fewer forces.

Taking this into consideration, it can be assumed that today, too, when fighting a battle even without the use of nuclear weapons the side which is suddenly subjected to severe, surprise fire pressure will in the majority of cases sustain significant losses and may suffer defeat, despite numerical superiority. This is explained by the fact that very often a significant or even decisive materiel and morale superiority over the enemy on the selected axis the seizure of the initiative, and the creation of necessary preconditions for quickly routing the enemy is achieved by surprise

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though promptly implemented. Consequently, the ability to deliver a surprise strike or strikes when other conditions are equal permits getting the greatest results with the least expenditure of forces, means, and time.

But perhaps surprise acquires its greatest significance when the battle is fought with nuclear-rocket means. Actually, is is possible to have a sufficient amount of nuclear and rocket weapons, well-equipped and trained podrazdeleniya, chasti, and soyedineniya with high morale and still not achieve success due to the inability to prepare and launch surprise combat operations. It will be even more difficult for those troops who themselves are subjected to enemy surprise attacks.

Surprise is a most important requirement for all combat conditions, the skillful execution of which is an indicator of the tactical skill of commanders and staffs and the result of their strictly planned, creative, carefully organized, and active work.

The attainment of surprise is by no means an individual and narrow problem of tactics reduced to any one measure, for example -- to forestalling the enemy, as the author concluded. Forestalling the enemy is only one method of achieving surprise. Besides this, many other methods, which to a significant degree encompass many factors of preparing for and conducting a battle, can be used: for example, when the battle is conducted in the most efficient and unexpectedly created (for the enemy) grouping, and when the troops are completely combat ready at a time when the enemy troops are not yet fully combat ready. Various methods of troop combat operations can also be used for the purpose of achieving surprise: nuclear rocket strikes, swift separation of tank groupings, maneuver by fire, employment of forward detachments and airborne landings, etc. -- appropriate action against which the enemy can least of all count on in a situation and it therefore will be difficult for him to show organized opposition.

In our opinion the article should have devoted more attention to the role of fire in modern combat and the necessity of carefully organizing it.

There can hardly be any doubt that in modern conditions fire is the most important aspect of destroying the enemy and achieving success in combat as a whole. At the same time it is necessary to consider the sharp growth of fire power of chasti and podrazdeleniya. However, the fire power of troops is only an objective possibility for achieving success in the course of a battle. The main thing consists of the ability to organize the fire system most profitably and skillfully, foreseeing purposeful and flexible use of powerful and long range fire weapons in combat.

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It is necessary to consider quick planning, preparation of fire of all weapons, and creation of a single firing system as the most important requirement in organizing not only the defense, as was previously thought, but also the offense, meeting engagement, and pursuit; that is, in organizing all conditions of combat operations. Fire planning must comprise the main content of the commander's decision. Solution of the problem of creating fire superiority over the enemy depends chiefly on this, not just on the availability of a great quantity of fire weapons.

In modern conditions, when the time factor has sharply risen in importance, it is necessary to be able to organize fire in a very short period of time, getting the broadest and most flexible coordination of all available weapons, a high continuous state of readiness of them for a quick opening of fire, and maneuvering of fire for destruction of targets arising again (usually mobile targets), and also for destruction of the most important objectives without preliminary adjustment fire. The special role of reconniassance, without which it is impossible to deliver fire strikes effectively, must be emphasized. Reconnaissance must provide timely acquisition of the most reliable information on all exposed targets and objectives.

The fire system in all cases must be organized so that the commander can deliver surprise fire strikes and quickly concentrate fire on any threatened axis in the course of the whole battle by means of broad, quick, and flexible maneuvering of fire power. In this connection it must be noted that the organization of fire on a tactical scale is a whole complex of interrelated measures, beginning with the formation of the grouping of manpower and equipment and ending with the organization of their control.

When nuclear weapons are used, the fire of conventional weapons must be closely combined with nuclear strikes. The organized fire of conventional fire weapons will play an especially important role when nuclear weapons are not employed, about which the author spoke.

For some reason or other the article made no mention of such an important problem as combating enemy air attack weapons in the various combat conditions. At first glance it might seem that if the troops know how to organize effective air defense in a situation where nuclear weapons are used, then they could handle this problem all the more so in a non-nuclear conflict. However, upon examing this more carefully it is by no means true. Creating an air defense system when nuclear weapons are not used requires accounting for very important features in the use of air attack weapons. In the first place, the primary, and perhaps the only means of enemy air attack in the given conditions will be aircraft. In the second

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place, the density of enemy aircraft will grow significantly and the constant threat of employment of ballistic and cruise missiles by the enemy will remain. All this requires a well thought out and somewhat different organization of the air defense system than when the sides use nuclear weapons.

The article pointed out correctly, in our opinion, that the organization of coordination in modern conditions has become much more complex in comparison with the past. We would like to elaborate on this by adding that the complexity of coordination is explained by the appearance of new weapons and a sharply increased diversity of the general quantity of the combat weapons existing in soyedineniya and chasti, by a significant increast in the depth of combat missions and the breadth of the zones of operation, and also by the increased tempo of waging battle. Consequently, the volume of work of commanders and staffs in the organization and maintenance of coordination also increases. In addition, in modern combat, particularly when the sides employ nuclear weapons, more frequent disruption of coordination is possible and it will therefore have to be re-established more often. With this, the factor of time and space will play an even more important role than previously.

In the offensive battle a different solution of the problems of organizing coordination between tactical airborne landings (and, on seacoast axes, naval landings) and forward detachments attacking on these axes is required. The operations of both will have to be coordinated according to mission and time with such timing that they are unified to a maximum degree in delivering strikes and achieving the ultimate goal of the battle. The commander and staff, in addition to organizing coordination directly between airborne landings and forward detachments, will have to anticipate striking with tactical nuclear-rocket weapons and support aircraft in their own interests.

Organizing the struggle against the enemy's tactical nuclear-rocket weapons, which will be concentrated on a significant front and at great depth, carefully concealed, camouflaged, and protected by air defense weapons, is a new problem of preparing for and conducting a battle. Timely concentration of the efforts of all available forces capable of destroying nuclear weapons, and which the enemy does not expect to be employed, are required to conduct this struggle effectively.

It is emphasized in the foreign military press that in modern combined-arms combat, particularly when nuclear weapons are employed, the organization of the struggle against radioelectronic systems is

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a new and difficult problem. It is pointed out that the problem arose due to the use of many types of new weapons, combat equipment, and troop control based on or strongly dependent on radioelectronics. Foreign specialists see an objective possibility of successfully combating radioelectronic systems in the ever increasing "dependency of weapon systems on electromagnetic radiation as the connecting link between their separate elements... An essential shortcoming of these weapon systems is that radiation of high frequency energy in the majority of cases is susceptible to detection, and interferrence can be created in the operation of radiotechnical systems." (R. J. Schlezinger, Radioelektronnaya voyna (Radioelectronic Warfare), Translated from English, Voyenizdat, 1963, page 8) And in fact, today radio communications equipment, radar, television, infrared equipment, equipment for checking and preparing the launch and control of tactical rockets, etc., includes the most varied radioelectronic systems. Based on this, foreign specialists believe that in order to disrupt troop control and various combat weapons it is enough to paralyze these systems.

In the course of the battle both sides, in connection with the large number of numerous radioelectronic systems in the troops, will be faced with the necessity of organizing not only the struggle against them but also protection for them. Various special technical systems and new methods of operation will be needed to accomplish this.

From everything that has been said, it follows that at the present time it is necessary to plan and accomplish combat training of troops in such a manner that exercises and tactical training are conducted not only in conditions where the sides employ nuclear weapons, but also when they are not used, under the constant threat of nuclear attack by the enemy. Only those soyedineniya, chasti, and podrazdeleniya which master combat situations to perfection can become fully combat ready and combat able.

CALCULATING A MARCH WHEN RUBBLE AND OBSTACLES BLOCK MARCH ROUTES

Col K. LAPSHIN
Lt Col Ye. GALITSKIY

The execution of large operational regroupings of troops is becoming one of the special features of conducting modern military operations. As is well known, any regrouping of troops is accomplished by a march of soyedineniya and chasti in independent columns. Moreover, battlefield maneuvers and other regroupings in a period of military operations involve considerable space and time. All this presents certain requirements for the accurate organization of marches on the basis of careful calculations.

The most important indices of regroupings in an operational-tactical plan are the high speed of their execution and the preservation of the maximum combat capability of the units and soyedineniya making the march, both during the shift and upon arrival in the designated area. These indices are closely connected with such factors as the troops' level of march training, the presence and condition of roads, the season and weather conditions, troop cover against enemy strikes with weapons of mass destruction, and others.

Without examining the entire complex of questions concerning the organization of a march, let us dwell on one question, in our opinion the most important, -- the effect of rubble, obstacles, and the ground configuration of march routes on the speed of troop movements and march schedules.

It is universally recognized that in situations involving the use of nuclear weapons the most suitable march routes for the movement of troops are selected in detour of the damaged sections of roads, even when this means a considerable increase in the length of march routes, so that troops are not required to rebuild routes. In our opinion, it is absolutely necessary to consider that the condition of detours and the presence of barriers and obstructions on them may decrease the rate of march.

In a nuclear war, zones of destruction may be so wide that it will often be impossible to select detours. In this case troops will have to negotiate rubble, obstacles, and difficult sections of march routes. Thus, in our opinion, it is very important to consider the condition of march routes in the zone of regrouping to correctly organize a march and its engineer support.

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The rate of march may be seriously affected not only by rubble and obstructions on the roads, but also by other natural and man-made obstacles. Operations of the Great Patriotic War abound in instances where there were accumulations of troops at crossings of even narrow water barriers and where march columns were elongated because of natural barriers, resulting in a loss of troop control and making it necessary to adopt measures to tighten up the columns and restore control. The main reason for these occurrences lies in the fact that in planning the march the actual condition of march routes and the detrimental effect of various obstacles on the march formation were not given sufficient consideration.

Practice shows that a march does not proceed at the same speed on all march routes. On good paved roads troop columns can move at a rate of several tens of kilometers an hour. On dirt roads, especially those with sharp turns and steep grades, the interests of safety require a reduction in speed and sometimes an increase in the distance between vehicles in the columns. Consequently, even a small section of a march route on which troops must reduce speed is, in effect, a type of obstacle.

Many road sections which are unsuitable for a swift march of troops and the movement of equipment, passes through obstacles, and even certain engineer-technical constructions can not be regarded as obstacles in the literal sense of the word. However, in the time required to negotiate them, the elements mentioned above and encountered on a route are in the same category with actual natural barriers, obstacles, and rubble. Therefore, it is not incorrect to conditionally regard as obstacles sharp turns, long and steep grades, marsh-ridden and badly worn sections of dirt roads, temporary detours, passes in log obstacles and mine fields, certain types of military bridges, etc., since each of these slows down the movement of troops to a certain degree.

As a result of a reduction in the speed of columns when negotiating rubble and obstacles, not only is the time required for the march increased, but the order of march may also change because of the different capabilities of various types of combat equipment and transport vehicles to negotiate obstacles and barriers encountered on the route. The adverse effect of various obstacles and poor sections of road on a march can be reduced in a number of cases. The improvement of march training, the careful organization of engineer support for the march, and the supply of combat equipment and transporters with means of

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increasing their cross-country capabilities and with night vision devices facilitate high speeds of troop movements. In addition, increasing the rate of march is dependent on the thorough reconnaissance or march routes, the efficient control of troop movements on them, and the ability of commanders and staffs to control movements in rapidly changing conditions and consider the time of day, weather, and other factors.

Calculating the march, determining the formation of columns and the speed of the troop movement under actual road conditions, is also very important in our opinion. In calculating a march it is important to determine not only the total duration of the movement, taking into account the time required to negotiate rubble, obstructions, and other obstacles, but also to determine the order of movement of the columns which will facilitate the accomplishment of the mission and preserve the column formation during the entire march. However, the methods of making such calculations are, it seems to us, inadequate.

Let us examine the manner in which a column of combat or transport vehicles negotiates obstructions or short sections of bad road. The reduction in the speed of the forward elements of the column when approaching an obstacle may cause the column (length L_o) to begin to shorten as the distance between vehicles decreases. Following this, especially in cases where it is necessary to increase the distance between vehicles while they are negotiating the obstruction, there will be a concentration of troops in the rear of the column and even a temporary halt. This can be avoided be selecting the proper distance between vehicles in the column. This distance, of course, depends on the rate of march, visibility, the nature of the obstacles, and the training level of the drivers. In forseeing the negotiation of this or that obstacle, when the permissable speed (V_p) and the distance between the vehicles (d_p) at the moment of crossing the obstacle is known, it is possible to calculate the proper distance between vehicles (d_o) which they must maintain during the entire march. For this purpose we suggest the simple formula $d_o = d_p \frac{V_o}{V_p}$ (1), in which V_o is the average rate of speed on sections of the march route where there are no barriers.

Suppose, for example, that in the course of a march troops must cross a water barrier via a floating bridge. The permissable distance between vehicles and speed on the bridge are $d_p = 25$ meters, $V_p = 15$ kilometers per hour. The average march speed (V_o) is 30 kilometers per hour. The proper distance between vehicles on the march is determined by the formula

$$d_o = d_p \frac{V_o}{V_p} = 25 \cdot \frac{30}{15} = 50 \text{ meters.}$$

With the distance d_o arrived at in the given formula the column L_o will cross the water barrier without delay. If in our example the distance between vehicles were less than 50 meters, there would be a concentration of vehicles at the barrier, which would be most undesirable since it would creat favorable conditions for the enemy to deliver a nuclear strike against the troops.

What happens after a column crosses a barrier? As the lead vehicles cross the barrier and increase their speed to the designated average speed, the column stretches out. Its length before the barrier is $L = L_o \frac{d_p V_o}{d_o V_p}$ (2). If in our example the length of the column (L_o) is 1.5 kilometers, and the distance between vehicles (d_o) is arbitrarily set at 25 meters, the length of the column after crossing the barrier will be $L = \frac{1.5.25.30}{25.30} = 3.0$ kilometers, i.e., twice as long. If the distance between vehicles is set at 50 meters, the length of the column before the barrier will be 3 kilometers, and after the crossing it will remain the same: $L = 3 \frac{25.30}{50.15} = 3$ kilometers. Consequently, there will be no lengthening of the column following the crossing and the march formation and schedule will not be disrupted.

The next important step in organizing a march is, in our opinion, the selection of the distances between column of troops. Usually this distance is established with consideration for the antinuclear defense of chasti and podrazdeleniya, so that the explosion of one enemy nuclear shell would not simultaneously destroy several columns. In addition, it is important to remember that the distance between columns depends on the nature of the obstacles or barriers on the march routes and the established distance between vehicles in the columns.

Thus, if the troop movement is being made on march routes where there are no obstacles, the distance between columns may be equal to the radius (R) of the safe distance from the center (epicenter) of a nuclear explosion. In actual regroupings troops are required to overcome obstacles, barriers, or bad sections of roads; therefore, possible delays at obstacles must be taken into account in selecting the distance between columns. In other words, when one column is crossing the barrier the next column must be at a safe distance from the barrier (R), which is determined by the commander according to existing instructions and the situation.

If this requirement for the distance between column is not observed when negotiating barriers, rubble, and obstacles, the distance between the columns may shorten and, at worst, the columns may come together,

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[illegible] and watching the anti-nuclear defense of the troops. Therefore, in planning a march it is advisable to establish that distance between columns which will make it possible to maintain a safe distance between them, despite possible decreases in the established distance.

If in the course of a march several barriers or short (up to 300-500 meters) sections of damaged roads must be negotiated in succession, it is advisable, in our opinion, to establish the distance between columns by the formula $D = L_o \left(\frac{d_p V_o}{d_o V_p} - 1\right) + R$, in which D is the distance between columns in kilometers, and R is the minimum safe distance in regard to antinuclear defense. If the distance between vehicles is determined according to formula 1, it is easily seen that D equals R. In other cases it may exceed that distance. If, for example, troops are making a march in columns, each having a length (L_o) of 1.5 kilometers, a march speed (V_o) of 30 kilometers per hour, an obstacle-crossing speed of 15 kilometers per hour, and a distance between vehicles in the column on the march and at obstacles (d_o and d_p) of 25 meters, $D = 1.5 \left(\frac{25 \cdot 30}{25 \cdot 15} - 1\right) + R = 1.5$ kilometers + R.

Consequently, when the distance between vehicles decreases, the length of the column decreases, but at the same time it is necessary to correspondingly increase the distance between the columns. Increasing the distance between vehicles to the calculated extent results in only an insignificant increase in the overall depth of the march formation and therefore has practically no effect on the duration of the march. Moreover, when distances between vehicles in columns are established according to the suggested formula, the march formation is maintained both during and after the crossing of obstacles, rubble, and short sections of bad roads.

It is more difficult, of course, to organize a march along march routes on which there are rubble and obstacles of considerable length. The procedure for the negotiation of such obstacles by a single column of troops remains the same as in the negotiation of small obstacles; however, the nature of the negotiation of obstacles by a column of considerable length -- for example, a soyedineniya consisting of several individual columns -- changes considerably. This is explained by the fact that each column can approach the obstacle only when the last vehicle in the preceding column is a safe distance (R) from it. Since the rates of speed on the march and through obstacles are different, it is necessary, in order to preserve the designated distance, to

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increase the distance between columns in advance, or halt the columns for a certain time prior to approaching the obstacle, or have the entire column move at the same speed as that of the vehicles crossing the obstacle.

In the first method of constantly maintaining a safe distance between columns when negotiating an obstacle of great length, the distance (D) between them must be $D = R \cdot \frac{V_o}{V_p} + L_o \left(\frac{d_p V_o}{d_o V_p} - 1\right)$. It is easy to see, however, that with such distances the depth of the march formation increases considerably, troop control is more difficult, and the duration of the march increases considerably.

In the second method of shortening a given march formation, the troops columns make a halt in a well concealed place when an obstacle is encountered. The duration of the halt will not be the same for all columns and will depend on their positions in the overall march formation. The further a given column is from the lead column, the longer it will have to halt. The waiting period may by determined by the formula $T = \frac{D_r}{V_p}\left(1 - \frac{V_p}{V_o}\right) + \frac{nL_o}{V_p}\left(\frac{d_p}{d_o} - 1\right)$ (4), in which D_r is the distance between the obstacle and the column concerned in meters, and n is the position number of the column. If the distance between vehicles is the same during the march and during the negotiation of obstacles ($d_p = d_o$), the formula (4) is simplified as follows:

$T = \frac{D_r}{V_o}\left(1 - \frac{V_p}{V_o}\right)$ (5).

Let us examine this in an example. Three troop columns approach an obstacle. The length of each is 3 kilometers; the march speed $\begin{pmatrix} V_o \\ V_p \end{pmatrix}$ is 30 kilometers per hour; the speed of movement through obstacles is 15 kilometers per hour; the distance between vehicles in the march and at obstacles (d_o and d_p) is 25 meters; and the distance between columns is 5 kilometers. The second column is 8 kilometers from the obstacle, the third -- 16 kilometers. The first column begins to negotiate the obstacle immediately after encountering it. The second column will have to wait a period of time determined by the formula (5);

$T = \frac{8}{15}\left(1 - \frac{15}{30}\right) = \frac{4}{15}$ hr = 16 minutes. The third column will have to wait $T = \frac{16}{15}\left(1 - \frac{15}{30}\right) = \frac{8}{15}$ hr = 32 minutes. When this time has elapsed, the columns can begin to move at the march speed and negotiate the obstacle without halting.

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In the third method of shortening a march formation when negotiating rubble, obstacles, and bad road sections of great length, all the columns reduce their speed to the rate for negotiating obstacles when the first column approaches the area. This can be accomplished most simply when the march is controlled by radio. However, in the interest of security radio equipment will not, as a rule, be used in regroupings. Therefore, in planning a march, it is necessary to establish in advance points or lines at which each column must reduce its speed.

In all cases it is necessary to organize a commandant's service (traffic control service) on the march route and to have communications helicopters and other mobile means for controlling the march. In the event of the sudden appearance of additional obstacles, barriers, or rubble on the march routes -- for example, the destruction of bridges by the enemy or nuclear strikes against road junctions -- the necessary corrections must be made in the march schedule. In such cases it is expedient to use belt roads or trails to quickly bring the troops back on the main march routes.

After negotiating an obstacle the columns will stretch out and there will be a considerable increase in the distance between them. If that distance on the march, before the obstacle, was equal to the safe distance (R) from the center of a nuclear explosion, the distance between columns after the barrier has been crossed will be $D = R \cdot \frac{V_o}{V_p}$.

This stretching-out of columns can be avoided in various ways. The desired result is achieved if the head of the column maintains the same speed at which it negotiated the barrier until all columns have passed it. This method makes it possible to avoid gaps and the stretching-out of columns, but increases the time which troops spend in the vicinity of the obstacle, which in many cases may be a likely objective of enemy reconnaissance and a subsequent nuclear strike.

The lengths of columns and the distances between them following the negotiation of an obstacle can also be shortened by halting the head of the column in a well-protected place until the rest of the columns can catch up. If the transport capabilities of the equipment permit, the lengths of the columns and the distances between them can be shortened without a halt by reducing the speed of the lead vehicles of the first column and increasing the speed of the other columns. Obviously, this method is best suited for small columns of high-speed vehicles and well-trained drivers on good roads. It would be difficult to use this method at night, in poor visibility, or if there are heavy vehicles or trailers, in the columns.

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A certain amount of time is lost in overcoming rubble, natural barriers and difficult areas in the course of a march. Therefore, the actual average rate of march may differ from the established rate. A particulary great reduction in the rate of march may take place when negotiating a number of successive obstacles. In this case the degree of reduction in speed will depend on the size and length of the obstacles, the distances between them, the permissible speed of the columns through the obstacles, and other factors.

It is interesting to note that the time spent in negotiating obstacles does not depend on the order of their location on the march route. Whether troops cross a short obstacle first and then a long obstacle, or vice versa, the rate of movement does not change. Thus, calculating a march involving the negotiation of various obstacles is greatly simplified.

The time required to execute a march, from the moment the head of the first column passes the departure line to the moment of concentration in the designated area, can be determined by the following formula: $T_m = \frac{L_m - A}{V_o} + T_{pr}$ (6), in which T_m is the time required for the march in hours; L_m is the length of the entire march route in kilometers; T_{pr} is the time required to negotiate the obstacles in hours. The last item can be determined by the following formula: $T_{pr} = \frac{L_k + A}{V_p} + \frac{sL_o}{V_p}\left(\frac{d_p}{d_o} - 1\right)$, in which L_k is the depth of the march formation in kilometers; s and L_o are the number and lengths of the troop columns in kilometers.

Thus, the duration of the march can be calculated by formulas 6 and 7 if the condition of the march routes, the march formation, and the rate of march are known.

In practice, another problem must frequently be solved. Given the time in which the march must be completed, the make-up of the march columns, the condition of the march routes, and possible enemy resistance, it is often necessary to determine the rate of march. Mathematically this means that the time for the march (T_m) is given in formula 6 and it is necessary to determine the rate of march (V_o). Thus, we have $V_o = \frac{L_m - A}{T_m - T_{pr}}$.

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Let us assume that troops must make a march of 190 kilometers in eight columns, each 3 kilometers long, the overall depth of the march formation (L_k) being 60 kilometers and the distance between vehicles in the columns on the march (d_o) 25 kilometers. On the march route there are the following obstacles: a floating bridge 0.4 kilometers in length, a steep upgrade of 0.3 kilometers, and a badly worn section of dirt road 15 kilometers in length. It is necessary to determine the time required for the march if the maximum speed of the columns (V_o) is 30 kilometers per hour. The speed through obstacles (V_p) is set at 15 kilometers per hour.

According to formula 7 we determine $T_{pr} = \frac{60+15+0.3+0.3+0.4}{15} +$

$+ 8 \cdot \frac{3}{15} \left(\frac{40}{25} - 1\right) = 5\frac{1}{15} + \frac{72}{75} = 6$ hours.

We find the time required for the march according to formula 6:

$T_m = \frac{190 - 16}{30} + 6.0 = 5.8 + 6.0 = 11.8$ hours = 11 hours, 45 minutes.

Now let us solve another problem. The march time (T_m) is 10 hours; it is necessary to determine the march speed on the sections of the march route where there are no obstacles. According to formula 8 we find $V_o = \frac{190 - 16}{10-6} = \frac{174}{4} = 43$ kilometers per hour. Consequently, troops can not move to the new area at a slower speed and arrive in the given time. If there were no obstacles on the march route, the time for the movement would be $T_o = \frac{L_m + L_k}{V_o} = \frac{190 + 60}{30} = 8$ hours, 20 minutes. Thus, the obstacles in the example increased the time required for the march by 3 hours, 28 minutes.

These calculations make it clear that the success of a march depends on the correct evaluation, in advance, of the nature of the obstacles on the march routes, which greatly affect the speed of the columns and the ability to preserve the march formation. Thus, the prediction of possible variants in the execution of a march on given march routes and the determination of the time required for a troop movement are of great practical value. The results of such timely prognoses take on a special importance during a battle, when the commander will have, as a rule, a very limited time in which to make a decision on a march or the execution of a maneuver.

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The possibility of the shortening of a march formation when crossing small obstacles during the march depends on the distance established between vehicles in the columns. If there are several small obstacles on the march route, it is expedient to establish the distance between vehicles according to the formulas which we have suggested, taking into account the parameters of movement through the most difficult obstacle. In this case, the distance between columns is established with consideration for antinuclear defense and means that the march formation in general will be preserved during the entire march.

To preserve the march formation when negotiating obstacles of considerable length it is necessary to halt the columns for a certain time both before and after the obstacle or to move all columns at the speed used in negotiating the obstacle. This requires that the march be more carefully organized than under ordinary conditions. In planning a march it is important, in our opinion, to consider the possibility of a reduction in the march speed necessitated by obstacles or barriers on the march routes. Here the average speed depends on the number, length, and nature of the obstacles and rubble. It is therefore important to estimate the possible parameters of movement at all obstacles on march routes.

The methods set forth in this article do not exhaust all variants which may be encountered in practice. Therefore, the further development and improvement of these methods is, in our opinion, beneficial. In particular, the analysis of typical march routes on various types of terrain (flat, moderately rugged, mountainous, etc.) is of great practical interest. The resulting materials, which could best be presented in the form of tables in graphs, should, in our opinion, be checked and corrected during troop and special training exercises.

INCREASE THE ROLE OF HIGHER MILITARY EDUCATIONAL INSTITUTIONS IN SCIENTIFIC RESEARCH

CPYRGHT

by Col V. CHOPOROV

The Communist Party and the Soviet government have always attributed great importance to the development of scientific research in higher schools. The party's attention to increasing the role of higher schools in scientific and technical progress has become newly evident in the decree of the Central Committee CPSU and the Council of Ministers USSR, "On the Further Development of Scientific Research Work in Higher Educational Institutions," which was adopted this year.

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Although many of our higher educational instututions, including military schools, are conducting serious scientific research work and have undoubtedly achieved positive results in this sphere, it is still a fact, as noted in the decree, that higher schools are not sufficiently active in participating in the struggle for scientific and technical progress, and that the enormous resources of highly qualified scientific personnel of higher educational institutions have not been fully utilized.

According to their purpose, Soviet higher educational institutions are not only schools, but also scientific establishments. In the struggle for scientific and technical progress, our higher schools perform their role both by training highly qualified cadres and by direct paritipation in scientific research work and the introduction of its results into practice, i.e., into production, since they have wide opportunities for this. Scientific research of higher educational institutions must become an integral part of all Soviet scientific research work.

Scientific research work of higher military schools is aimed at the solution of current problems in military affairs in the light of recent achievements of science and technology. In this connection, this article will discuss some questions of an organizational nature, the solution of which would, in our opinion, improve scientific research work in higher military educational institutions, give it a wider scope and greater depth, and make it possible to utilize more fully the potentials of our military academies and schools in this respect.

A large force of professors, docents, and doctors and candidates of sciences, is working in our military academies and higher schools. While more than 50 percent of scientists are regular staff members of higher educational institutions in the country as a whole, the concentration of scientific cadres in military educational institutions of the Armed Forces is even greater.

Improvements in the quality of scientific and pedagogical cadres of higher military educational institutions have been particularly noticeable in the past few years. For example, in a number of academies most of the instructors of the overwhelming majority of special chairs now have academic degrees and titles. The professors and instructors of higher military educational institutions are not only a numerous but also, without exaggeration, the theoretically best trained force of scientists, with a great amount of experience in scientific work. They make a large contribution to the development of military science, but there is no doubt that we might expect even greater results from them if more favorable conditions were created.

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The scientists are actively supported in their scientific research by engineering and technical workers and auxiliary teaching personnel, who sometimes participate directly in the scientific research work. In addition to teaching personnel, the higher educational institutions have numerous graduates who take an active part in scientific research of great theoretical importance, and thereby make a noticeable contribution to science even before they have defended their dissertations.

Finally, the third and largest group of persons, constantly being renewed and supplemented, consists of the students and officer candidates. The final-course students of most higher military educational institutions annually prepare diploma projects, and the students and officer candidates of senior courses also prepare course projects. Many of these projects have the nature of scientific research work. If their themes are correctly chosen and closely related to requirements of military theory and practice, they are of considerable value for military science and military affairs.

However, the participation of students and officer candidates in scientific research work is not restricted to the preparation of diploma and course projects. An increasing number of students of higher educational institutions are now taking part in scientific research as members of voluntary military science societies and various study groups. The further development of the creative forces of studying youths and their even greater pariticipation in scientific activities represent some of the tasks based on party requirements.

The scientific work of students is closely connected with the study process. Its purpose is not only to guarantee their best possible training as future specialists, but it also helps them, while still at school, to develop work methods for conducting independent scientific research.

When we speak of students of higher military educational institutions, especially military academies, we must bear in mind that the great majority of them are not students of civilian higher educational institutions who usually come to a higher school right after graduating from a secondary school, but that these are officers who have not only secondary, but in some cases a higher military or military-technical education in a specialty, as well as considerable practical experience in production or with the troops. This educational level of students of military academies enables them to participate more rapidly in research work.

As we have seen, higher educational institutions have great possibilities for scientific research. However, can we say that they have been fully utilized by educational institutions in conducting scientific research? We believe not.

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Speaking at a conference of workers of industry and construction of the RSFSR in April 1963, Comrade N. S. Khrushchev indicated the need of make fuller use of scientific cadres of higher schools. He said: "Scientific workers of higher educational institutions can do much for the development of science and technology and for production. In foreign countries, particularly in the US, many scientific projects are conducted by universities. Capitalists finance these universities and give them assignments, and the universities work in particular themes in which the business firms are interested." Nikita Sergeyevich recommended a more extensive use of the army of scientific workers in higher schools for scientific research of certain problems, which are important to the national economy. The party is now giving careful attention to this question.

As we know, one of the measures aimed at improving scientific research work at higher educational institutions was the introduction of a new method of determining the number of professors and instructors at a school. Formerly, there was a single, obligatory norm for the teaching load of all instructors. Each instructor had to fulfill this norm, regardless of whether he was engaged in research or not. According to this norm, the staff of instructors for each chair, faculty, or higher military educational institution was determined. A different procedure has now been adopted, i.e., the total number of instructors for higher military educational institutions is determined in accordance with an established ratio of the number of students to one instructor, or the so-called average norm of calculating the number of professors and instructors. The distribution of instructors among chairs and faculties is done, essentially, by the higher military schools themselves. The directors of higher military educational institutions are given the right to determine the teaching load of instructors, on the basis of the approved teaching staff. The teaching load must be determined by taking into consideration both the teaching and research work, within the limits of the established length of a working day for the instructor.

All this makes it possible to distribute and utilize the scientific and teaching cadres more correctly and efficiently, to create objective conditions for a general improvement of the teaching process, and to allow instructors a maximum amount of time for research.

Unfortunately, the possibilities inherent in this important measure are far from being used to their full extent. For example, the distribution of instructors among faculties and chairs is sometimes made, apparently by tradition, in proportion to the number of students or the volume of teaching work. There is no use denying that in such cases some workers of higher military educational institutions secretly use the old norms as a guide line.

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There has also been a lack of constructive approach in matters of improving the teaching process, i.e., the forms and methods of instruction. Important technical facilities, such as movies and television, have not been sufficiently used in the teaching process, nor have cybernetic devices and other modern scientific and technical achievements been applied widely and correctly to the instruction of students. Insufficient attention has been given to the development of independent reading by students, or to their independent work in laboratories, and to the elimination of deeply rooted habits of "cramming" in a study course.

In seeking more efficient forms of teaching, one should develop the independent work of students more strongly. It should be stressed that innovations in the teaching process, aimed at a further improvement in the training of cadres and an improvement in scientific work done by instructors, should be encouraged in every possible way.

An important factor determining the success of scientific research work in higher military educational institutions is their technical and experimental facilities. During the past few years, much has been done in this respect. Experimental training plants have been established by some higher military educational institutions, and existing experimental training workshops have been reorganized or expanded. Most of the higher military engineering schools have established scientific research laboratories for work on essential projects. Higher military schools have received a better supply of new models of equipment and instruments.

However, the material and technical facilities for higher military schools can not yet be regarded as sufficient or perfect. In some cases, the facilities do not permit the conduct of extensive experiments, particularly along new lines of scientific development. For example, some higher military schools still have no scientific research laboratories. Electronic computers, which are now indispensable for serious scientific research, are not always available in sufficient quantities to academies and schools. Experimental facilities in higher military schools continue to be a bottleneck, thus delaying the conduct of important scientific research and a more complete utilization of scientific forces.

The rapid development of science demands a solid material foundation. In this connection Comrade N. S. Khrushchev stressed the important role of scientific cadres of higher schools in the struggle for technical progress, as follows: "...In our country, an enormous army of scientists works in universities and institutes, and frequently, because of poor laboratory equipment and lack of necessary equipment in educational institutions, their role is reduced

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merely to teaching. However, a scientist, no matter where or what subject he is teaching, must necessarily engage in experiments even for the purpose of improving his qualifications. The proper facilities must be available for this purpose." N. S. Khrushchev's statement, undoubtedly, may be applied also to military educational institutions.

In organizing scientific work in higher military schools, it is very important to provide "problem laboratories" and specialized scientific research laboratories. In the next few years they will, apparently, be further developed. In accordance with a decree of the Central Committee of CPSU and the Council of Ministers USSR, higher educational institutions may install new laboratories for conducting scientific research work on long-range and current scientific problems. The right to establish such laboratories is given to the ministries and departments to which the higher educational institutions are subordinated. They perform this work in coordination with the Ministry of Higher and Specialized Secondary Education USSR and the State Committee for Coordination of Scientific Research Work USSR.

At the same time, it should be noted that the further development of scientific research work in our higher military educational institutions does not depend merely on the creation of new laboratories and the increase of engineering-technical and auxiliary personnel. The directors of higher military schools, as well as other supervisors who are in charge of such schools, are right when they place the emphasis on the search for internal reserves and a more economical and efficient utilization of available human and material resources.

The present trend is directed at new, current projects, wider participation of all military personnel, the formation of scientists' and designers' groups on public principles, the activation of voluntary military science societies, study groups under the supervision of chairs, etc.

However, to further the development of scientific research in higher military schools, only one method has so far been used, i.e., the creation of a school's "own" facilities in the form of separate scientific research laboratories working on specific subjects. The law concerning the strengthening of ties between schools and practical life has recognized the expediency not only of organizing scientific research laboratories and institutes under higher educational institutions, but also of merging some scientific research establishments with higher schools. Unfortunately, this requirement has not been adequately met as far as the Armed Forces are concerned, although we believe that the necessary conditions exist. In this case, we are speaking not only of the creation of special experimental facilities,

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Put into use the combination of efforts of scientific personnel in higher educational institutions and scientific research establishments, which would enable the solution of important and complex scientific problems.

The lack of coordination between scientific organizations and the dissipation of resources, as noted by the November 1962 Plenum of the Central Committee CPSU, are the main obstacle to a successful development of science and an acceleration of technical progress. This deficiency may also be applied, to a certain extent, to military scientific organizations. In our opinion, it would be more correct and certainly more efficient to combine the groups of scientists working on the same projects of modern science, both on a theoretical and a practical level. After all, present-day science is mainly the sphere of collective activity and the result of combined efforts of many people. In the Armed Forces, too it would be possible in some cases to establish closer contacts, and then to effect an organizational merger of higher military educational institutions (academies and faculties) with military scientific research establishments working on identical or related projects. This form of cooperation between scientific and educational organizations would have great advantages and benefits. Above all, it would have a positive effect on the conduct of scientific research work.

The joint efforts to two groups of scientists, i.e., those of a higher military educational institution which employs scientific personnel with a higher theoretical level and a wider scope of specialties, and those of a scientific research establishment which is engaged mainly in work of an applied character, would enable the implementation of complex scientific research in the best possible way. These possibilities could be considerably expanded, as we noted before, by inviting the participation of graduates and sufficiently trained students, of engineering-technical and of auxiliary teaching personnel in active scientific work.

As a result, the staff of professors and instructors would be able to use the modern laboratory equipment of a scientific research establishment for the solution of practical problems, and to utilize the results of scientific research for the expert training of young specialists. This would be a direct way of strengthening ties between school and practical life, between theory and practice. In that case, it is not necessary to create similar scientific establishments at the higher military school itself. Considering the fact that such a merger would reduce the fairly numerous administrative and service personnel, this measure would also be economically important, in addition to improving the scientific research work.

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Moreover, the associates of scientific research institutions, including important scientific specialists, would be available for teaching classes to students, and would be able to conduct such instruction not only in the classrooms, but also in the laboratories of the scientific research establishment, making use of modern equipment and the latest achievements of scientific and technological thought. This would improve the quality of training and educating young specialists. In this manner, the second important task would be accomplished, i.e., the improvement in the training of officer cadres. Finally, the availability of scientific associates for teaching activities would make it possible to relieve the professors and instructors of higher military schools of some of their teaching load and give them more time for conducting scientific research.

Thus, as a result of a merger of scientific research establishments and educational institutions, favorable conditions are created for improving the whole training process and for independent study and scientific work of students, which is required by the decree of the June Plenum of the Central Committee CPSU, The students will be able to spend much of their time in laboratories of scientific research institutes, and this work should be considered as part of the training process.

Looking at the matter from a wider point of view, such cooperation between higher educational institutions and scientific research establishments would provide favorable conditions for solving a number of other problems. For example, it would enable a better approach to the question of personnel selection and placement, the transfer of scientific workers (for one reason or other) from pedagogical work to scientific research, and vice versa. A scientific establishment would have the best opportunities to select young associates from the ranks of capable graduates of the higher military school who have shown a liking for scientific research and have already acquired some experience in scientific research work in the laboratories of the school.

We must not overlook one other question, i.e., the fact that as a result of a merger of similar-type educational institutions and scientific establishments the problem of coordination would also be solved, and duplication in work would be avoided. Frankly speaking, we do not see any other ways of eliminating such duplication.

Thus we can see from even an incomplete analysis of the postive aspects of such a merger that this measure would benefit both the schools and the scientific establishments and would contribute greatly to the general cause, which has great significance for the state.

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Some people have expressed doubts as to the feasibility of this matter. In their opinion, such a merger might have a negative effect on the training of personnel, or on the work in the sphere of scientific research. They say that if such a merger should involve a "stronger" educational institution, principal attention would be concentrated on the teaching process to the detriment of scientific research work. On the other hand, if the scientific research establishment should be stronger, it is believed that the training of cadres might suffer, since priority would be given to the performance of tasks concerning scientific research work. However, such an opinion is completely unjustified. On the contrary, the experience gained in this matter by civilian organizations has disproved such arguments. For example, in 1959 the Leningrad Institute of Water Transport Engineers was merged with the Central Scientific Research Institute of the River Fleet. As an experimental base, the combined institute was provided with an experimental plant. Such a merger of educational and scientific institutes, as stated by AREF'YEV, rector of the institute (Pravda, 13 August 1961), provided objective conditions for improving the teaching process, created wider opportunities for the scientific personnel of both institutes, and considerably helped the successful solution of important complex and exploratory themes. During a relatively short period, the total volume of scientific research work, directly related to the needs and requirements of the national economy, increased 2.5 times.

V. F. SIROTSKIY, Doctor of Technical Sciences, and prorector for scientific work of the institute, told a correspondent of Izvestiya: "At first we were not even aware of all the promising results that would derive from a merger of pedagogical processes with scientific research work." (Izvestiya, 20 February 1963).

So we see, all participants of such a creative union have been benefited by it, and so has the state.

The Novosibirsk State University, which was created on the basis of scientific research institutes under the Siberian Branch of the Academy of Sciences USSR, may serve as a model of this new type of higher educational institution. According to academicians LAVRENT'YEV and VEKUA, the university organizes all of its work in close cooperation with academic institutes for scientific research. The students are taught not only in university aduitoriums, but also in laboratories of scientific research institutes under the supervision of noted scientists. Beginning with the third course, the students spend part of their time in research institutes and participate, together with scientific associates, in the work on current scientific projects.

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In their turn, noted scientists of a scientific research institute give lectures for students, conduct seminars, and supervise chairs. All this made it possible to improve the training and educational work and to relieve the main staff of professors and instructors of some of their teaching duties so they could engage in scientific activities.

The positive results of close cooperation between the Tartu State University and the Institute of Physics and Astronomy, Academy of Sciences Estonian SSR, were discusses in Pravda by Academician F. KLEMENT, rector of the university (Pravda, 6 June 1960). According to KLEMENT, the further development of higher schools and scientific institutes in the Soviet Union should be determined by an increasing cooperation between these two types of establishments.

Academician N. SEMENOV discussed the beneficial effects of an actual merger of the Leningrad and Khar'kov physico-technical institutes with related training institutes for modern physics (Pravda, 26 November 1962). He recommended that academic institutes be merged with faculties of higher educational institutions even in those cases where they are subordinated to different systems. According to SEMENOV, the lack of coordination existing until now between Moscow institutes and leading higher educational institutions of the capital deprives both the Academy of Sciences and the higher educational institutions of many advantages.

Academician V. AMBARTSUMYAN also supports the expansion and strengthening of creative ties between universities and scientific research institutes. Expressing his approval of the suggestions made in this connection, AMBARTSUMYAN wrote in a newspaper article about his own first positive experiment, conducted in the Academy of Sciences Armenian SSR. The computing center of the Academy of Sciences in Yerevan was combined with the corresponding chair and problem laboratory of the state university. The direct contact between students and research scientists, and their work with modern computing machines stimulated their interest in scientific investigation and considerably broadened their knowledge on the required subject. (Izvestiya, 25 February 1963).

The examples cited above are convincing evidence of the beneficial effect on the training of young specialists and the development of scientific research by a merger or close cooperation between educational and scientific establishments. Considering the fact that over 30 scientific research institutes employing about

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1,900 scientific associates have already been organized in connection with higher educational institutions (Pravda, 3 June 1963), the cooperation of scientific research institutes and higher educational institutions in the USSR becomes even more important. This problem should also be solved in our Armed Forces.

The question raised in this article is new to a certain degree. Naturally, it still has many controversial aspects and, like everything new, it might meet with some criticism. The force of habit and existing traditions are still strong. For many years, we have been used to thinking that a higher military educational institution is one thing, and a scientific research institute is another thing. However, life is forcing us to change our opinions.

We believe that the most favorable conditions for such a merger exist in those arms (services), or in those types of scientific endeavor, where there is one higher educational institution (academy, faculty, or chair) and one scientific research establishment. In our opinion, whenever a school and a scientific establishment are located in the same city, it would be expedient to enter upon an organizational merger. However, if they are located in different cities and are completely isolated from one another, and if their merger on one basis is not yet possible, it would be more expedient to begin with a closer cooperation and coordination of their activities. Later, when the necessary conditions have been created, they could be combined on one material-technical basis.

Obviously, it is difficult to decide on such a step suddenly, and we do not even suggest that such mergers should take place everywhere. There should be a constructive approach to such a measure. Possibly, there are other forms of effecting closer cooperation between scientific research establishments and higher educational institutions. Perhaps it would be worthwhile, as an experiment, to begin by effecting such a merger of one or two scientific research institutes with military academies or faculties. Such an experiment should be studied, and then applied more widely. However, a beginning should be made. In one way or another, this problem must be solved in the interests of the cause. That is a requirement of our times.

The June Plenum of the Central Committee CPSU instructed the appropriate organs to ensure the consistent and complete fulfillment of the law concerning the strengthening of ties between schools and practical life. The solution of these problems would be one step ahead on the way to carrying out this important party directive. Scientific research should, in all cases, be carried out in higher educational institutions on the basis of close cooperation with scientific research institutes, planning and design organizations, and other scientific establishments.

THE US ARMED FORCES INTEGRATED COMMUNICATIONS SYSTEM

by Col V. GOLITSIN, Col V. ORLOV, and Lt Col V. TSELENKOV
(based on Foreign Press)

The fundamental changes in the character of modern war caused by the availability of strategic rocket and nuclear weapons have made it necessary for the US command to perfect its existing system of control with the wide implementation of automated means.

However, as reported in the US press, in spite of the use of automated means in the system of troop control, this system had many essential shortcomings. Primarily this system did not make it possible for the government to react quickly to changes in the international situation. It did not have enough back-up and reserve command posts, and did not permit continuous control if a headquarters was destroyed in conditions of great destruction. The system of control used separate lines of communication intended for various branches of the armed forces, individual components, and various types of departments. Finally, the system of control did not permit enough control over nuclear weapons to exclude the possibility of their chance or ill-intentioned use without the sanction of the supreme command.

Thus, the system of control did not permit the unified management of all branches of the armed forces either in peace or in wartime. It was necessary to develop a centralized system of control which would guarantee constant management of the whole military machine in case any of its individual elements was out of commission.

After considering the importance of this problem, the Secretary of Defense gave a special report to the government concerning the necessity of developing an automated system of control unified on a national scale for all the armed forces of the country and recommended that a fundamental reorganization of the existing system be accomplished.

In 1959, the ruling circles approved the report of the Secretary of Defense and decided to reorganize the existing system of control and to use it as a basis for the development of a fundamentally new automated system of centralized control for the US Armed Forces to be used by the President, the Secretary of Defense, the Joint Chiefs of Staff, and their deputies and aides. Consequently, this system was called the National Military Command System, or NMCS.

This system was to be developed within three-five years. Work was conducted in the two following major areas: the development of a rapid, global, and automated unified system of communications capable of permitting effective control of the Armed Forces in any situations; and the development of organs for centralized control, primarily command posts and centers for the collection and processing of information.

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After a necessary amount of these operations were completed, the command intended to exercise constant control over the armed forces while transferring from the old to the new system of control.

Thus, the National Military Command System had to consist of both operational organs and of technical means to permit effective operation of these organs.

The basic prerequisites for the implementation of the above-noted measures were the development of technical means of control, especially means of communication and electronic computers, the accumulation of experience in the use of automated systems for the control of troops and weapons systems, and practice in the employment of electronic computing equipment to solve certain problems in the Department of Defense and other government establishments.

Global communications systems for branches of the Armed Forces. As noted above, the US Armed Forces command system used global systems of communications which were developed separately by the Army, the Air Force, and the Navy.

The Army developed the Army Command and Administrative Network or ACAN which subsequently was called the Strategic Army Communications System or STARCOM. The Air Force developed the Global Communications System, or GLOBECOM, which as its mission was increased was renamed first the Strategic Communications Network, or STRATCOM, and then the Aerospace Communications Complex, or ATRCOM. The Navy also developed its own system of global communications called the Naval Communications System, or NCS (Signal, September 1963).

These systems used wire communications, short-wave radio communications primarily with the use of single-sideabend frequencies, radio-relay lines, and radio communications using tropospheric and ionospheric radio wave scattering.

Relay stations with their switching equipment and receiving and transmitting radio centers with electric power supply sources were constructed all over the earth near large control installations and military bases. The basic type of point-to-point communications were multichannel teletype printer circuits.

As requirements for control and consequently for communications increased, equipment was modernized, basically by improving the following: the traffic carrying capacity of communication lines by introducing multichannel and multiplex telegraph apparatus and employing methods for the automatic switching of communication channels; the reliability of communications by using single-band shortwave radio communications in combination with highly efficient antenna systems and the use of the

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long-line trans-Atlantic cables and radiocommunications using tropospheric and ionospheric scattering of radio waves; and signal security by using automatic equipment for linear ciphering.

The communications systems of the branches of the armed forces mentioned above could not be used effectively in the functional development of the a National Military Command System, since they did not meet the communications requirements caused by the availability of strategic nuclear and rocket weapons and because of their low efficiency and high cost. This circumstance and also the growing shortage of qualified personnel to service this complex equipment caused the US command when they decided to develop a new system of control in 1959 to decide also to unify the global systems of communications of all branches of the Armed Forces. This unified system is called the Defense Communications System or DCS.

Since each branch of the Armed Forces had developed its own system of communications to meet its own requirements, it was only natural that the equipment which they used was different. Also, the methods of using these means of communication were different, which made it impossible to unify them into a single system without having a special organ to prepare the development of the communications system and exercise centralized management after unification.

Thus, in May 1960, upon the order of the US Secretary of Defense, a unified communications system was established called the Defense Communications Agency, or DCA. This administration was entrusted with solving basic tasks: the unification of the global systems of communications of the branches of the Armed Forces into a single system in conformance with presented requirements, the realization of effective management for this system; the maintenance of maximal operational responsiveness, survivability, and reliability of the communications system; the supervision of future planning for the development of the unified communications system; and the supervision of the effective and economical use of the means of communication of all branches of the Armed Forces. (Signal, September 1963).

Complex centers for the control of Communications were established at first to control the Defense Communications System. These centers consisted primarily of national and zonal communications control centers located in the US, the Hawaiian Islands, Alaska, and Europe. Experience accumulated in managing a unified system of communications showed that the number of control centers had to be increased. Thus, in October-December 1962, six regional control centers were activated in the Philippines, Japan, Labrador, England, Spain, and Turkey. (Missiles and Rockets, 25 March 1963). In July 1963 the Defense National Communications Control Center was renamed the Defense Communications Agency Operations Center. Its organizational [illegible] times.

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The unified control of communications was subordinated to the Department of Defense. However, operational management was exercised by a joint committee of the Chiefs of Staff and control over the activities of the DCA in the realms of research, development, planning, and financing was entrusted to the Assistant to the Secretary of Defense for Strategic Systems of Communication.

The DCA has three administrations. Their chiefs are the deputy directors of DCA for communications systems for communications and electronics of the National Military Command System, and for the use of communications satellites. There is also an administration for control of White House communications. This last administration is included in the Defense Communications Agency Operations Center in Washington which has subordinated to it, as mentioned earlier, zonal centers in the continental US, Alaska, Europe, and Pacific Ocean areas, and regional centers in Labrador, the Philippines, England, Spain, Turkey, and Japan, and also the center for the technical support of the National Military Command System (Missiles and Rockets, 23 March 1963).

The overall number of personnel employed in the DCA, including the regional and zonal centers for control of military communications, is approximately 2,000 people.

The regional centers of control submit hourly reports concerning the condition of communications of the region over which the zonal system of control is responsible. The zonal systems of control, in their turn, transmit received data to the Defense Communications Agency Operations Center in Washington.

The brief hourly reports on the status of communications contain data on inoperative communications channels, the reasons for lack of communications, the amount of traffic on channels, etc. The operations control center, the zonal centers, and the regional centers in their areas of responsibility are responsible for the use of alternative channels, the use of reserve means of communication, the correction of malfunctions, etc. There are instructions in every zonal and regional center of control, which indicate measures to be taken in case means of communication are out of commission in extraordinary circumstances. The Defense Communications Agency Operations Center and the zonal centers are provided with automatic displays which portray the condition of their communications on special screens. Automatic equipment has been set up only in the operational center. Automation is being completed in the zonal centers.

The Defense Communications Agency exercises management and control over the operation of the Defense Communications System, but is not concerned with the operation of means of communications in this

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system. The operation and servicing of the system including contracts for the development of equipment, its testing, and acceptance is done by the communications organs of the Army, Air Force, and Navy.

The 256 people of the Communications Systems Administration are concerned with problems of current and future planning, the allocation of communications channels, analysis of the operation of all systems as a whole and of its individual elements, drawing up tactical and technical requirements for developed communications systems, standardization of equipment, and methods of its use. Daily management of the operation of the Defense Communications System is exercised through the Defense Communications Agency Operations Center which operates on a 24-hour basis.

The Communications and Electronics Administration of the National Military Command System is involved in planning the development of technical means for the system, the elaboration of equipment, and the constructional and financial support of all operations. At the present time, this administration is concerned basically with scientific research work. Its activity is directed toward the development and implementation into the control system of complex electronic equipment which is being developed on the basis of the latest achievements of science and technology. The development and implementation of the following equipment is currently being carried on: high-speed computers; automatic transmission, input, and output of information; equipment to permit the rapid dissemination of necessary information; integrated and standardized display systems; high-speed systems for interrogation and rapid retrieval and display; printers capable of printing up to 100,000 characters per second; equipment for the transmission of graphical material such as maps, charts, and graphs, with a time of no more than 30 seconds required for transmission; and equipment to display situations with the portrayal of up to 4,000 simultaneous characters and a long-term display requirement of up to two minutes (Signal, September 1963).

The Administration for the Use of Communication Satellites. In the opinion of US specialists, the Defense Communications System has many fundamental shortcomings including basically the circuits' vulnerability to modern weapons and the insufficient interference-killing features of radio communications. To correct these shortcomings, the military leadership of the US has proposed the development of a communications system using artificial earth satellites. A special administration for the use of communications satellites was established as part of the Defense Communications Agency to coordinate efforts in this realm.

Work on the development of a communications system using artificial earth satellites is divided between the Army and the Air Force. The Air Force is responsible for the development of satellites and placing them

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in designed orbits. The Army is entrusted with the task of developing ground equipment. The National Aeronautics and Space Administration, the Air Force, and many other organizations are conducting experimental work for the use of various artificial earth satellites in communications, including the development of active relay stations, passive reflectors, synchronous active relays, etc.

A system of 24-30 active repeater satellites launched into polar orbits at altitudes of approximately 9,000 - 22,000 kilometers is considered the most promising for the use of the Armed Forces. (Astronautics and Airspace Engineering, September 1963).

Plans have been made for launching 5-6 satellites simultaneously with one carrier rocket. Ground equipment for this system will consist of mobile and stationary ground stations. Four satellites and 5-6 ground stations are planned to be used in the first experimental system.

The satellite, which has been developed by the Air Force, is a simplified version of the familiar Telestar satellite which is a relay weighing approximately 50 kilograms.

The leaders of the DCA believe that a communications system using artificial earth satellites may be put into operation in 1966-1967. (Interavia, November 1963).

The White House Communications Administration. The National Military Command System must provide the president with all that is necessary for making decisions. Thus, for the highest level of coordination of strategy, diplomacy, and intelligence activity by the president, a special command post called the Situation Center was established within the framework of the National Military Command System. Its operations are organized by the Central Intelligence Agency, and communications support is provided by the Defense Communications Agency through the White House Communications Administration.

The Technical Support Center of the National Military Command System has responsibility for the input and automatic processing of data necessary for making decisions by operational organs of the National Military Command System. It has five specially established computing centers subordinate to it.

The Defense Communications Agency is responsible for supporting the centralized administration of the US Armed Forces within the framework of the National Military Command System through the Defense Communications System which in March 1961 was subordinated to the Defense Communications Agency.

the global communications systems of the branches of the Armed Forces, namely the NCS, ATRCOM, and STARCOM, each of which consisted of long-range and tactical communications complexes. Presently, it is a single global system of long-range communications used to supply all types of operational information to the Department of Defense and other governmental organs including all command and subordinate organs.

Immediately after the unification, communications channels were allocated between branches of the Armed Forces and individual organs. As shown by operational experiences, such an allocation sometimes led to the ineffective use of channels, since some of them were overloaded and some were not used enough, which is one of the reasons for the implementation of automation in the Defense Communications System. The implementation of automatic switching of communications channels allowed a significant increase in the traffic-carrying capacity of communications lines because of the more uniform distribution of traffic on channels by the method of constant search for open channels and by means of the multiplexing of communications channels.

Presently the Defense Communications System has over 5.5 million channel kilometers of telephone lines and 11 million channel kilometers of teletype lines. The system consists of over 100 large relay stations and communications centers located over the earth which can permit rapid transmission of information to subscribers using automatic and semiautomatic equipment for switching communications channels. (Signal, September 1963).

The overall cost of all equipment used in this communications system is evaluated at 2.5 billion dollars. The system is operated by over 30,000 people.

The establishment of the Defense Communications System has already permitted the US command to quickly deploy additional communications nets for supporting the operations of the Armed Forces in case a situation becomes complicated in any region of the world. Thus, according to General McDavid, in the fall of 1962 when the situation in the Carribbean Sea became complicated, the Commander in Chief, Atlantic was able to establish an extensive system of communications in addition to that already established in the comparatively short time of eight days. Approximately 60,000 kilometer channels of telephone and telegraph communications lines were deployed additionally on the eastern coast of the United States and in Florida.

For further automation of the Defense Communications System, future plans envisage transfer to a universal unified system of communications, as the Universal Integrated Communications System, or UNICOM. This system

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organs of the military administration and the garrisons of US troops which are scattered over the earth by means of teletype, telephone, and facsimile communications and the transmission of data in both ciphered and graphics form. It should also tie all command levels into a single and complete network. It must answer the modern requirements of reliability accuracy, and secrecy, high capacity, flexibility and compatibility with both military and commercial communications networks. The basis of the system will be composed of telephone communications channels which according to plans are to be used for the transmission of information by telephone, teletype, facsimile processes, and in ciphered form. Since wider bands are required for the transmission of this information, wide-band equipment is being developed. The development of this system of communications will require much effort and expense. Therefore, most attention is presently being paid to improving presently-available communications equipment to meet certain requirements and to develop a net for the automatic transmission of data for use in electronic computers called the Automatic Digital Network, or AUTODIN, and an automated telephone network called Automated Voice Network, or AUTOVON, which will be the basis of the future universal communications system for the US Armed Forces.

The predecessor to the AUTOVON network is the Army Communications System called the Switched Circuit Automated Circuit, or SCAN, which is in use in the continental US for the automatic dial switching of telephone channels. This system permits the rapid direct connection of armed forces users located in the US and is intended for the exchange of information by ordinary telephone equipment or by the telephones which use special scrambling equipment and also for the transmission of data by facsimile or in ciphered form. The SCAN system services 154 subscribers in the continental US. (Signal, September 1963).

The first net for the automatic transmission of data for electronic computers called AUTODIN has already been placed in operation. This network services approximately 300 subscribers of the Air Force, Army, Navy, material and technical support organs, and military industries.

The basic network is composed of five automatic switching centers located in the continental US and seven manual switching centers located overseas.

To avoid parallelism and duplication in the further development of the Defense Communications System and to permit the effective transfer of long-range communications lines into it, there is a strict demarcation of functions and responsibilities among the communications services of the branches of the Armed Services, based on geographical regions, nets, or individual questions.

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nance and effective operation of the installations and nets which they transfer into the unified Defense Communications System.

The heaviest responsibility is entrusted to the Air Force Communications Service since more than half of all the installations of the Defense Communications System belongs to the Air Force. The Air Force has transferred 256 wideband radio communications stations, including radio relay, microwave, and tropispheric, and 170 narrow-band high frequency radio communication stations operating on independent sideband frequencies and time division multiplex transmission, and ordinary single channels to the Defense Communications System. Air Force Communications Service has responsibility for the operation of many networks which are intended chiefly for the support of Air Force operations on a global scale.

Thus, the Air Force operational network called Air Operations Network, or AIROPNET, services all Air Force bases and is the medium for the rapid transmission of information relating to the control of aircraft flights. The Air Weather Net provides timely transmission of weather data to all Air Force elements who require the reception of this information.

The Air Force Communications Service also services part of the global system of teletype communications of the Defense Communications System and part of the network for the automatic transmission of data for use in electronic computers. More than 50 major relay stations and 684 Air Force stations operate in the above-mentioned teletype communications nets. More than 17,000 Air Force communications specialists work in the unified Defense Communications System. It should also be noted that the Air Force presents the greatest requirements for the Defense Communications System, since out of the 20,000 communications channels under the supervision of the integrated system, 15,000 are used by the Air Force. (Signal, September 1963).

The US Army Signal Corps has transferred into the Defense Communications System 42 major relay stations which were formerly part of the STARCOM global communications system.

The main center joining these stations is the army communications complex which has elements located both in Washington itself and in areas around it. It includes the Army Communications Center in the Pentagon, the transmitting Station in Woodbridge Virginia and the Receiving Station in La Plata, Maryland. This Communications Center is serviced by more than 70 direct trunk line connections with Europe, the

Middle East, North Africa, Panama, and the Hawaiian Islands, and also relay stations located in the western US at Fort Leavenworth, Kansas, Fort Lynnwood, Washington, and Davis, California (Signal, September 1963).

The Army Pacific Scatter Communications System which, with the use of ionospheric radiowave scattering, stretches 10,500 kilometers from the Hawaiian Islands to the Philippines with eight intermediate stations is a main integrated system of communications which will be extended to Japan and Korea in the future.

Naval Communications has transferred into the Defense Communications System 27 major stations located around the earth and integral to the NCS strategic communications system. U.S. Naval Communications is entrusted with responsibility for the development of an integrated complex of communications in the areas of the Hawaiian Islands and the Islands of Guam and Puerto Rico. The US Navy services five major centers for automatic switching of communications channels in the continental US (Signal, September 1963).

After the establishment of the Defense Communications System in 1962, all the communications means located in Puerto Rico were consolidated into a single communications complex at the former communications station at Fort Allen which also received the terminal equipment for the communications line formerly located at Ramay Air Force Base and at the Naval Communications Station in San Juan. The capabilities of the communications complex at Puerto Rico will be increased greatly by the addition of two supplementary communications lines from Fort Allen to Ramay Air Force Base and from Fort Allen to Roosevelt. A transmitting center at Fort Allen and a reception center at Silanas were built to establish the communications complex on the island of Puerto Rico.

The plan for the development of the communications complex on the Island of Guam envisages the redevelopment and modernization of existing communications lines and the establishment of new ones and also the construction of receiving and transmitting centers and a center for radio relay communication.

To further centralize the management of all governmental administrative organs, President Kennedy on 21 August 1963 issued a directive for the establishment of a nation-wide communications system which was to be called The National Communications system, or NCS. Responsibility for the establishment of this system was entrusted to Secretary of Defense McNamara. The former director of the DCA, Lt Gen Starbird was named as Director of the National Communications System.

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by integrating communications systems including those of the Federal Aeronautics Administration, or FAA, and the National Aeronautics and Space Administration, or NASA, etc. Completion of this system is planned for 1964.

The established of the Defense Communications System and the completion of the construction and outfitting of the major centers for the control of electronic computing equipment and apparatus to display situational data has made it possible for the US military leadership to put the National Military Command System, or NMCS, into operation.

The National Military Command System was put into operation by order of the Secretary of Defense with a directive dated 2 June 1962. Essentially it is an aggregate of control organs and technical means which can be used by US governmental authorities to exercise control over the Armed Forces. This system is supposed to permit the following: the rapid dissemination of the most important decisions of the higher organs of the US Military Administration including the President, Secretary of Defense, and Chiefs of Staff, to the executors both in the US and in theaters of military operations under any conditions; and the rapid transmittal and display of operational and intelligence operations for rapid and timely reaction to situational changes in any region of the earth.

At present, the national system for the operational control of the Armed Forces includes the following organs: the National Command Center in the Pentagon which is unfortified and intended for the execution of command functions in peacetime and in conditions of limited warfare; the Alternate National Command Center located in the fortified underground installation at Ft Ritchie which is 50 kilometers north of Washington; the National Emergency Airborne Command Post located on airborne aircraft, which are modified KC-135 aerial refueling aircraft; and the National Emergency Command Post Afloat located on a ship at sea which is presently Northampton and will later be the ships Wright and Saipan. (Armed Forces Management, July, November 1963)

All of the organs of the National Military Command system mentioned above are equipped with technical means to permit the visual display of situational data, electronic computer complexes and other equipment, and also communications means which are maintained in constant operational condition.

The National Command Center in the Pentagon operates on a 24-hour basis and is operated by 50 officers and sergeants who are subordinate to the Joint Chiefs of Staff and work in four shifts. Each shift is headed by a colonel and is made up of three groups: intelligence, situation evaluation, and operations. The operations group makes necessary decisions

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the alternate command posts, both stationary and mobile, are fewer in number, but their functions are the same as in the National Command Center.

The operations group of the shift or duty in the National Command Center is located in one room which is equipped with direct telephone communications so that each officer can immediately be connected with any command, both in the continental US and overseas. Situations are displayed on both electronic screens, and ordinary maps mounted on movable panels. A communications center is located in a separate room, next to the main operations room to provide communications for the National Command Center with any command of the Armed Forces.

The National Military Command System depends extensively on the following command posts belonging to branches of the Armed Forces: The Army War Room; the Navy Flag Plot; the Air Force Command Post; and the Emergency Actions Center.

The National Military Command System is connected with the command posts of unified and special commands.

The command posts enumerated above are equipped with modern equipment. The Air Force with its 473L system, NORAD with its COC-425L system, and the Strategic Air Command with its 425L system have the most modern systems of control.

Although the National Military Command System is considered a military system it is connected with the control systems of the following governmental organs: the White House, the State Department, and the Central Intelligence Agency.

It must be said that the degree of automation in the National Military Command System is negligible in comparison with the 465L and 473L systems. Presently, a plan is being worked out for its automation with the extensive use of electronic computers and communication satellites. Work for the perfection of the National Military Command System is planned for completion in 1967.

From the brief description of the National Military Command System and its supporting communications system, it is not difficult to see that the US military leadership is making every effort to develop a system for controlling its Armed Forces which would satisfy all the requirements of a modern nuclear and rocket war. The desire of the US ruling circles to continue to enlarge aggressive military preparations has nothing in common with the latest reduction in international tension.