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MILITARY THOUGHT (USSR): Speeding Up the Automation of Control Processes in Ground Forces Formations
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Speeding up the Automation of Control Processes in Ground Forces Formations

by

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In an article with the above title* General-Leytenant of Communications Troops P. Kurochkin has set forth his point of view on the matter of automating troop control. Contrary to the established opinion that it is necessary to have integrated automation of control processes from bottom to top based on the use of computers and other automatic and semiautomatic equipment produced especially for military application, the author proposes to resolve this problem using computers from the civilian economy and existing communications channels. In his opinion this automation must be limited to the operational levels (front, army).

On the whole, the author's proposals are conceived as a second direction for automation and presented as if in contrast to an initial direction.

We consider that only an automated system of troop control will make it possible to eliminate the gap which has formed between the forces and means of armed combat and the systems for controlling them. Unquestionably the introduction of an automated troop control system into the troops must take place in stages, taking economic and technical capabilities into account. Stationary electronic computers from the civilian economy may also be used temporarily at one of the initial stages. (This is already being done in operational training.) They are particularly useful in the field of scientific research, in solving various combat training and supply problems in military districts and in central institutions of the Ministry of Defense, and, without any question, in training personnel for a future

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*Collection of Articles of the Journal "Military Thought", No. 1 (83), 1968.

automated system.

P. Kurochkin's proposals to diverge from the path of integrated automation, in the development of which he participated actively at one time, did not come into being by chance. The author indicates that two serious obstacles stand in the way of an automated system of troop control; the need for substantial economic outlays and the great loss of time involved in the introduction and mastery of complex technical means.

Without denying these difficulties, we nevertheless regard them as surmountable. Moreover, pertinent experience must also be taken into account, and it shows that in the majority of instances no positive progress has been observed when an army has been supplied with equipment produced without consideration for the specific requirements of war; on the contrary, this has inevitably led to our lagging behind our potential enemies.

As regards difficulties connected with the expenditure of time in mastering complex technical means, it must be kept in mind that the later we begin the introduction of automated equipment into the troops, the longer this process will be drawn out. However, the first step must be taken, because without it we cannot go forward.

Citing the actual use of general-purpose computers from the civilian economy for automatic solution of problems during operational training, the author concludes that it is desirable not only for the staffs of military districts but also for the staffs of ground forces formations to use mobile versions of these computers under combat conditions.

The author sees the essence of the proposed automated systems in the following: "Computer centers -- composed of mobile-version MINSK-22-type computers as well as punchcard and keyboard calculators, also adapted for vehicle transport -- are being developed for front and army command posts. To ensure dependability and continuity of operation, each computer center must be designed for two positions (operating and reserve)..."

Thus, this system involves an autonomous complex of machines to serve the internal needs of a given (front or army) staff. This system provides for a "mating" of the manual work of

collecting, organizing, and entering information with the operation of automatic calculators, the latter role being allotted to the MINSK-22 computer. It is proposed to do the most time-consuming work manually, as previously.

It is therefore not surprising that such a system is considerably cheaper than integrated automation, but unfortunately it eliminates none of the problems of troop control. Moreover, neither the mobile nor the stationary MINSK-22 computer produces the expected results, because it is not capable of solving the information problems which, as is well known, comprise the basis of control. The correctness of this statement is confirmed by the experience of using the mobile variation of the RAZDAN computer for troop control.

If it is a question of employing computers from the civilian economy for military purposes in peacetime, there should hardly be any objection to it. But it would be highly erroneous to conclude from this that such computers are suitable for controlling troops under field conditions in a combat situation.

The reference to the experience of the staff of the Order of Lenin Leningrad Military District concerns earlier experience in utilizing computers from the civilian economy under peacetime conditions with a low information load on communications channels and computers. The experience of this staff confirms the concept of the desirability of using civilian computers for certain tasks in the army in peacetime. We can grant the possibility of using them in interior military districts in wartime as well. But in our opinion, the experience of the Red Banner Leningrad Military District does not support the author's conclusion regarding the possibility of setting up automated systems in the field on the basis of general-purpose computers and existing communications means and using them under combat conditions.

In comparing the two directions in automation, the author has taken as his criterion of evaluation the increasing of reliability and efficiency in troop control. Efficiency is illustrated by a table showing the increase in work performance achieved through solving certain problems using a computer. 50X1-HUM

It is impossible not to agree that increasing efficiency is extremely important, but what we need for a qualitative jump in

solving troop control problems is not an overall increase in efficiency, which could be attained even on the existing technical base, but an increase in certain specific instances. We therefore consider that without specific quantitative expression the author's criterion is inadequate for revealing the advantages of any given direction.

The table illustrating the operating peformance of the OPYT system does not include data reflecting the results of employing computers for troop control during combat actions.

Analyzing the table, the author concludes that utilizing this system will make it possible to solve certain problems an average of 3.1 times faster than can be done manually. But it remains unclear as to whether this provides a fundamental solution to the problem or only a partial improvement of the existing system of control. Is this fast enough to satisfy the requirements of, let us say, rocket troops, air defense means, and combined-arms large units and formations, or is it not? It is impossible to evaluate the proposed system properly without the answers to these questions.

As is well known, the information circulating within a control system varies as to quality and as to speed of passage. There is urgent information and less urgent information. The urgent, or priority, information usually includes reports on enemy means of mass destruction, the employment of such means by both sides, the forecast of the radiation situation, and certain other data.

Increasing by a factor of 3.1 the speed of passage of priority information pertaining, for example, to the matter of delivering a strike essentially will not change anything, since such an acceleration will not ensure that our strike preempts the enemy, and the enemy will still have an opportunity to launch missiles before we do and to effect a timely change of his launch position.

Theoretical calculations have shown that the successful solution of such problems requires a 20- to 30-fold acceleration in the passage and processing of data, and staffs must receive them two to five minutes after the occurrence of an event. 50X1-HUM

Therefore, we consider that P. Kurochkin's proposals are acceptable only for the initial stage of automation, facilitating the transition to integrated automation of the processes of troop control in wartime.

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In our view, General-Leytenant of Communications Troops P. Kurochkin correctly indicates that there are two directions for solving the problem of automating control processes: first -- the establishment of an integrated automated system of troop control and second -- utilization, for automation purposes, of computers from the civilian economy in combination with existing military and government communications channels. The author is also correct in stating that all of the pros and cons of each direction must be carefully weighed in choosing the methods of automation.

For this purpose let us make a more detailed examination of the positive and negative aspects of the methods of solving the problem. The second direction is attractive because it makes possible the immediate automation of several processes of control in ground forces formations, as well as a sharp reduction in economic outlays. But how efficiently will this system function in a combat situation?

The automation method proposed by the author intends that only command posts of fronts and armies be equipped with MINSK-22 general-purpose computers. The tactical control levels, first of all the divisional command posts and all rear control posts, will remain without means of automation. This means that the collection, processing, and dissemination of situation data will take place, in the control system proposed by the author, within the same time frame as under the existing system. Moreover, to ensure that communications channels will be sufficiently reliable for satisfactory solution of problems by computer, it will be necessary, as the author himself indicates, to have manual readback or triple transmission of information, which would naturally cause additional expenditures of time. Thus, if the second direction is followed in automating, it will, on the 50X1-HUM whole, be only calculation problems which are involved, while information processes, i.e. collection, processing, and

dissemination of situation reports, will remain unchanged.

Under present-day conditions, when the time factor has acquired decisive significance, we cannot allow information processes not to be automated. Today situation reports must be collected considerably more frequently than in the Great Patriotic War period: two to three times per hour in regiments and divisions, one to two times in armies, and about one and one half times in fronts. At the same time the areas over which the reports are collected have become larger: three to four times larger in fronts, 10 to 11 times larger in armies and regiments, and 20 to 30 times larger in divisions.

The equipping of the troops with missile/nuclear weapons has resulted in a large quantity of data which must take precedence in transmission. In particular, all work connected with the collection and transmission of data on enemy nuclear attack means, with the making of decisions on the basis of the data collected, and with the transmission of orders to executors must be carried out in three to 15 minutes depending on the nature of the target to be destroyed, since the time the majority of enemy nuclear attack means stay at their positions is measured in minutes (nuclear artillery - five minutes, Lance missiles - 20 to 25 minutes, Pershing missiles - 30 minutes, etc.).

A considerably greater amount of detail in information has become necessary. Today, for example, a division must become aware in good time of every enemy nuclear battery. Even at the front level, each nuclear installation is taken into account. The total number of our own and enemy targets on which information must be obtained will reach: 150 to 200 for a division headquarters, 500 to 600 for an army headquarters, and about 1,000 for a front headquarters.

There also has been an increase in the number of types of information. In addition to the existing types (concerning our own troops, the enemy, the chemical and weather situation, etc.), there are now new types of information such as reports on nuclear strikes, radiation contamination, and the bacteriological situation. The volume of information on nuclear strikes alone, collected at a time of extreme tension, comprises about 1,200 words in a division, 3,000 to 5,000 words in an army, and as 50X1-HUM as 14,000 words in a front.

The experience of training exercises and maneuvers testifies to the fact that without automation of the processes of collecting and transmitting reports, staffs cannot cope with such a flow of information within the allotted time. According to data received from many military districts, combined-arms (tank) armies and motorized rifle and tank divisions, and also according to the results obtained by timing training exercises and command-staff games for the collection and processing of complete situation reports in a rapidly changing situation (enemy delivery of a massed nuclear strike), the use of existing technical means of control requires the expenditure of up to one to two hours in a division, up to two to three hours in an army, and up to four to five hours in a front.

The need to reduce information passage time is fully obvious. However, the automation method proposed by the author, while providing for a substantial time gain in solving calculation problems in army and front staffs, has almost no effect on the solution of information problems.

The lack of means of automation at the tactical level also requires the attachment of specially trained personnel to the army (front) field headquarters to code information, prepare punchcards, collate information, and enter it onto the calculator, which will take large amounts of time.

In seeking the optimal variant for providing technical means of automation to the control organs in an integrated automated system of troop control, we have used mathematical modeling to examine control systems in which the battalion, the regiment, and the division were each taken as the lowest level of automation. The last-named variant, in which the lowest level to have information transmitters is the divisional headquarters, is very close to the author's proposed system of automated control. Modeling by means of constructing network models of these variants, with their subsequent analysis and optimization, has shown that if the battalion is taken as the lowest level of automation, the troops can begin combat actions in accord with the decision of the commander of the army three to four times faster than if automation begins at the army staff level and information transmitters are allocated to division staffs. 50X1-HUM

Modeling was also performed for variants of equipping control systems with means of automation, variants in which only calculation problems or only information problems were solved. The first instance provided for automatic calculation of matters regarding the utilization of forces and means and for manual solution of all information problems. The duration of the entire control cycle was reduced in all by only 16 percent compared with the existing control system.

Another serious shortcoming in the automation of control processes by the second variant is the lack of a common automated control system for the various branch arms and the special troops, since information problems cannot be solved on a computer of the MINSK-22 type. This means, for example, that there will be no automatic exchange of information between the computers of the combined-arms staff and those of the staff of rocket troops and artillery, although reconnaissance reports collected by the combined-arms staff, particularly regarding enemy targets for the delivery of nuclear strikes, must arrive within a short time at the computers of the staff of the rocket troops and artillery. In turn, the same type of information collected by the reconnaissance organs of the staff of rocket troops and artillery must be forwarded immediately to the computers of the combined-arms staff in order to carry out the task of allocating targets among the various means of destruction.

We could cite many additional serious shortcomings inherent in a control system based on MINSK-22 computers and existing communications channels. In our opinion, however, one direction in automation should not be considered an alternative to the other, but they should be regarded as links in one chain of measures directed toward establishing a control system which will correspond the most fully to the nature of modern combat actions. Analyzing the second direction in automation from these viewpoints, we may conclude that the immediate introduction into control processes of computers employed in the civilian economy is of great importance. This is explained not so much by the fact that certain calculation problems in the staffs of formations will be solved more rapidly than manually, as by the fact that these computers will pave the way for the establishment of an integrated automated system of troop control. 50X1-HUM

Therefore, the introduction into control processes of computers designed for the civilian economy may be more correctly regarded not as an independent direction in automation but as a very important preparatory stage in establishing an integrated automated system, since only on the basis of such a system can reliable troop control be provided in modern combat and operations.

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In evaluating methods of developing the automation of control, two directions can be noted: on the one hand there will be extensive research, experiments, and test operation of means of automating the processes of controlling troops in a battle and operation, and on the other hand -- there will be automation (mechanization) of labor-consuming processes and activities performed by assigned personnel in their daily responsibilities.

General-Leytenant of Communications Troops P. Kurochkin, after a brief analysis of the development and introduction of automation into troop control processes over the last eight to ten years, attempts to define the next steps in the possible solution of this problem in the ground forces.

In our opinion the author commits an error in basing his conclusions on a small body of experience which he has distilled from the employment of computers in the daily work of staffs and troops.

The experience in the use of computers by the staff of the Order of Lenin Leningrad Military District can not serve here as sufficient basis for final conclusions. Scientific research shows that departments and directorates of the district staff, and central directorates of the Ministry of Defense, in most instances seek to submit for computer solution only problems which are unrelated and are independently programmed. It happens extremely rarely that the solution of one problem can serve as the initial data for solving the next. 50X1-HUM

There are very few problems of an informational nature in peacetime. The flow of information among computers of control organs is inconsiderable. The frequency of interchange also is low.

Classifying of problems by categories of priority is virtually unnecessary. The order in which they are processed usually is determined by schedule, or alternatively by orders of the senior chief.

Since each problem is solved independently, it is not necessary to have a special memory unit in the computer to retain programs, initial data, or different norms.

All of this has made it possible to use the computers available in the civilian economy for the automation of control processes.

These computers are technically capable of handling most problems of the control organs of a military district, in addition to which the computers are relatively cheap and easy to operate. It must be assumed that in the near future we shall succeed in using computers even more to handle the everyday needs of control organs and to carry out required tasks at training exercises. In doing this, it is true, we shall have to allow for numerous conventional activities, since stationary computers do not have the features required for controlling troops in a battle and operation. Nonetheless, if staffs utilize computers during training exercises, officers of control organs can become accustomed to working with computers, and labor-consuming processes can be made less onerous.

Thus, the automation of control which has been carried out so far using civilian computers of the MINSK-22 type, has made it possible to facilitate and simplify some processes, to speed up the performance of calculations, and to reduce the number of generals and officers needed for this purpose.

But this direction in automation certainly does not rule out research in the field of integrated automation of troop control in a battle and operation.

It would be a good thing, of course, if control organs could have the same computer equipment for both peacetime and wartime. But since troop control in a battle and an operation requires more complex equipment, which may be slightly delayed in rea 50X1-HUM the troops, computer equipment has had to be drawn from the civilian economy to meet everyday needs. Since this equipment is

mass-produced, it has become possible to equip military districts with computers having the same technical characteristics, in order to facilitate the interchange of computer programs and results.

Among the computers available in the civilian economy, the best model for our purposes is the MINSK-22. It can become the basic computer for the computer centers of military districts.

If this computer is installed in the mobile variation, it will become possible to bring electronic computer equipment into closer proximity to the needs of armies and divisions in training exercises. If training exercises are organized with this in mind, it will be possible to concentrate several mobile MINSK-22 computers in each given military district, forming a rudimentary, simplified automated control system. Such a system obviously will not satisfy anywhere near all of the requirements placed upon integrated automated control systems based on new technology. Nevertheless, this system will enable a wide circle of generals and officers to gain experience in utilizing computers for troop control.

In setting forth these considerations, we particularly emphasize our disagreement with Comrade P. Kurochkin's view on the desirability of using this type of computer not only in the staffs of military districts but also for the automation of control in the staffs of ground forces formations under combat conditions. Immediately following this statement, the author outlines an automated system based on the MINSK-22 computer and then draws the conclusion that it will be possible to use such a system to solve the pressing operational problems connected with making the most rational decision for an operation and with effecting a drastic reduction in the time needed to plan an operation. This, of course, is not so.

An analysis of the work of control organs in combat and operations shows that only individual calculation problems can be solved with the MINSK-22.

In an automated system based on MINSK-22 computers, a vital process will remain unautomated -- the information process. But 50X1-HUM this means that information on one's own forces, the enemy, nuclear strikes, etc., will have to be translated into machine

language in order to be used as initial data for solving problems. This task will put an additional burden on control organs. And, although we can allow ourselves the luxury of conventional activities in training exercises, it will be impossible to detach personnel for such unproductive work in combat.

Scientific research has shown that automated control of front and army troops, as well as of the units of a division, will require computers not just as calculators but as complexes of calculators, providing for simultaneous, not successive, solution of problems.

The development and introduction of such a system, which represents a vital direction in the development of automation of control in the ground forces, will, unquestionably, also demand economic outlays and time. But this does not mean that it should be rejected and replaced with a system based on the MINSK-22 computer, a system which will not ensure the control of troops under combat conditions.

Numerous research studies indicate that it is not only the economic expense which is holding back the establishment of an automated system of troop control. The means invested in an uncoordinated manner over the past ten years could have paid for if not an entire system, at least a substantial portion of one.

However, the fact that the ground forces do not have any unified scientific organ to direct the production and introduction of an automated control system has made it impossible to resolve this problem purposefully or to bring about the necessary coordination in working out prototypes of means of automation in accord with the accepted overall policy. Therefore, in many instances the technology appeared first and then the search was begun for ways to introduce it. The independent approach to producing separate forms of equipment has led to the situation that some of them are incompatible with each other. In order to utilize these forms in a system, it will be necessary to have additional adapters or to modernize existing forms.

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It seems to us that the first thing required is a systematic approach to the production of automation equipment and a unified

overall policy regarding these matters, a policy to which all organizations and departments concerned must adhere. And second, it is advisable to unite all scientific forces working in the field of automation into one ground forces scientific organ which would determine the basic tactical-technical requirements for the system and its individual forms, provide for correlation with the industrial organizations producing the system models, concern itself with software and programming, and work out the matters of experimental operation of the system in training exercises and the procedure for its introduction into the troops.

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In any automated control system, communications, as is well known, occupy a very important place, and General-Leytenant of Communications Troops P. Kurochkin quite rightly devotes a great deal of attention to them. The author examines the possibility of introducing means of automation into troop control, making use of existing communications channels.

Actually, the OPYT system was based on the communications system of the Order of Lenin Leningrad Military District and was supported mainly by overhead wire communications leased from the Ministry of Communications and by the communications centers of military staffs. This communications system, suitable for peacetime, was sufficiently reliable and dependable to satisfy the requirements for exchanging information.

These assumptions are also corroborated by the experience of a series of other training exercises employing computers. For example, in a civil defense training exercise conducted in the Latvian Soviet Socialist Republic, existing communications channels were also employed, and they provided for the exchange of information between the "center" and its subscribers.

It is emphasized in the article that the exchange of information at command-staff exercises, in which time for the solution of the majority of problems by computer was severely limited, was handled over electrical communications channels and in a limited time. Under field conditions, the matter became more complicated, because the reliability of communications decreased. In order not to delay the transmission of information, it was necessary to increase the number of

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communications channels.

If we take into account the existing tables of organization of communications troops, then, it seems to us, it will not always be possible to take this course.

In the Red Banner Leningrad Military District and in a number of other military districts, the reliability of communications even under peacetime conditions is not sufficiently high. In a period of combat actions, communications reliability may decrease sharply, in the opinion of Military Communications Academy specialists. The way in which the article proposes to increase reliability -- by increasing the number of channels -- may be considered only a temporary emergency measure, suitable for the initial period of independent utilization of computers in the troops in peacetime. An integrated automated control system requires communications reliability no lower than 0.9 to 0.95. It consequently is necessary to effect a sharp increase in the coefficient of serviceable operation of communications. It is obvious that the proposed ways of achieving this for an automated system of troop control in wartime are not fundamental but serve only as a partial measure.

In order to increase communications reliability, a whole complex of different measures will have to be applied. In our opinion, the principal measures may be the following: the placing in reserve status of channels, centers, stations, equipment, and sometimes even whole communications subunits; wide dispersal of the communications system to provide for its relative safety; improvement of the engineer preparation at installations of the communications system and their camouflage against all types of enemy reconnaissance; and many other activities.

The article also focuses attention on such an important aspect of the system as communications reliability. In transmitting over existing wire communications channels, one distortion will occur per 1,000 characters, and in transmitting over radio channels -- one or more distortions per 100 characters. If these information distortions are not reduced to the necessary minimum, satisfactory solution of problems by computer will be impossible.

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In the OPYT system, as the author indicates, representatives of the Military Communications Academy proposed a series of methods for increasing communications reliability: manual readback, semiautomatic readback, triple transmission, and a combined method. Utilization of any of the proposed methods will make it possible to increase communications reliability to the necessary level.

But will it always be possible to make use of these methods under field conditions and particularly in time of war? No, of course not. Moreover, manual methods of increasing communications reliability are absolutely unsuitable for an automated control system. The author emphasizes that the time element plays an important role in solving problems by computer under field conditions. But how can this be reconciled with the proposed methods of increasing communications reliability, which require spending additional time?

In an automated troop control system, one distortion per 10,000 to 100,000 characters is allowed in transmitting information by radio and radio-relay communications channels. These high requirements for reliability of information transmission in an automated control system are occasioned by the fact that telecoded information (i.e. information circulating in an automated troop control system) is transmitted in cipher form without redundancy, and it is impossible to correct an error as is done when transmitting logically connected information. Consequently, every error can lead to an incorrect solution of problems by the computer.

Therefore further increase in the reliability of information transmission is linked with the introduction into the troops of technical communications means and new methods for utilizing them. For this reason we cannot agree with the author, who considers that this does not require the development of new communications means.

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The need for extensive introduction of computer equipment into staffs is, in our view, indisputable. Moreover, such capabilities already exist: within our country there is a large inventory of electronic computers and punchcard calculating

equipment, as well as military and government communications channels. The actual operation of the system discussed by General-Leytenant of Communications Troops P. Kurochkin in his article has shown that it is completely feasible to use the existing technical means to increase the effectiveness of troop control in a military district.

On the basis of a favorable evaluation of the results of operating the OPYT system, the instruction is given: first, to consider the introduction of computer equipment into control organs as one of the most important everyday tasks for increasing the efficiency of the work of staffs and as a necessary condition for the subsequent mastery of automated systems; and second, in the period 1967-1970 to establish, in all headquarters of military districts and groups of forces, computer posts and computer centers, equipped with complexes of punchcard calculators and MINSK-22 general-purpose computers. At the same time, automation sections are to be established in all staffs of districts and groups of forces.

Clearly, computer centers in military districts will provide the capability to set up a unified system linked with the computer center of the Main Staff of the Ground Forces. This will make it possible to exchange computer solution results among the control organs of the different command levels on the basis of standardized documentation and work methods.

Therefore, the question posed by General P. Kurochkin regarding the independent direction for automating control processes in large ground forces staffs has gone from the theoretical stage to the field of practical realization.

Individual questions regarding the essence of this direction are open to argument, for example, the methodology of utilizing computer equipment in the everyday activity of control organs and in command-staff exercises, war games, and other operational training measures; the problems solved on a system; increasing the reliability of computer equipment, communications, and the system as a whole; etc. But the correctness of the direction itself cannot be disputed, since it has already become an objective reality.

Does this mean that stating this fact diminishes the need to develop integrated automated systems based on specialized computers, new high-performance communications means, and other technical means? Not at all. It is true, as Comrade P. Kurochkin has pointed out, that the establishment of such systems will require a great deal of time and considerable economic expenditures, because of the novelty of the problem and the need to overcome substantial technical difficulties.

Nonetheless, work in this direction must be expanded with all available means, since only such complexes of improved technical means can completely satisfy current demands for establishing a highly effective system of troop control.

It is characteristic that in such branches of the armed forces as the rocket forces, the air forces, and the navy, where the need for maximum automation of control processses is felt the most keenly, a great many specialized automated systems have been developed and are in operation.

The automation of control processes in the ground forces is a more complicated matter. This is due to the complexity of the modern operation as a many-faceted phenomenon involving a large number of different relationships and factors which influence the course of combat actions and which do not lend themselves readily to formalization.

At the same time, the interests of combat readiness require that active measures by taken immediately to increase the effectiveness of the control of large units and formations of the ground forces, regardless of what measures will be taken in this connection in the future. And since the military districts constitute the basis of the ground forces, it is precisely the military districts which must be the first to use the existing computer equipment extensively.

General P. Kurochkin has cited numerous generalized indices which testify convincingly to the substantial time saved by employing computers to perform various operational-tactical calculations, to the reduction in labor expended in performing numerous voluminous tasks, and to the existence of other ways of effecting economies. Let us cite one further example. It is well known how much time and energy are expended by the staffs of

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military districts in working out mobilization plans. For example, in order to work out or refine one variant for allocating personnel resources, 30 officers of the mobilization directorate expend two to 2.5 months. It is further obvious that this one variant will not always be the optimal one, and consequently the qualitative aspect of such planning is far from perfect.

The use of computers for this purpose will make it possible to solve the same problem in eight to ten hours. Thus it becomes possible to calculate several variants and to choose the one that conforms best to the status of the mobilization resources of a given district.

A mobilization plan can be amended by computer in one to two hours in line with a developing situation.

As regards operational training of troops and combined-arms staffs, all of the operational-tactical calculations required for planning an operation can be performed using existing computer equipment. Of great importance is the conclusion drawn by General P. Kurochkin concerning the capabilities of the existing communications system. Indeed, by applying a series of uncomplicated organizational-technical measures developed by the Military Communications Academy, communications reliability will be increased to a level which will ensure the attainment of considerable effectiveness in utilizing computer equipment.

In conclusion it should be stated that the author is correct in saying that systems based on existing computer equipment and existing communications means are not equivalent to the projected integrated automated systems from the standpoint of capabilities for increasing the effectiveness of control. But in the first place, the use of existing computer equipment does not require a great deal of time or significant economic expenditures, and secondly, and this is the main point, the establishment of systems on the basis of existing computer equipment and communications means will make it possible to increase the efficiency and effectiveness of control right now, which will unquestionably promote an increase in the combat readiness of the ground forces. Finally, the extensive utilization of existing computer equipment will enable staffs to accumulate experience in working under conditions in which control organs are well

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supplied with technical equipment, thus creating the prerequisites for effective mastery of future automated systems.

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