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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

25 April 1978

MEMORANDUM FOR: The Director of Central Intelligence
FROM : John N. McMahon
Deputy Director for Operations
SUBJECT : MILITARY THOUGHT (USSR): The Use of Automated
and Mechanized Means in Organizing the Work
of a Front Command Post

[Redacted]

1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought'. In this article the authors share the experience gained from operational exercises and games in the Leningrad Military District at which questions of using automated and mechanized means of troop control were studied. They discuss specific applications of computers, keyboard and punchcard calculators, recording devices and photofacsimile and secure communications, and comment on the advantages and shortcomings of such equipment and the organization of personnel used in performing various data processing and transmission tasks. The latter part of the article is devoted to experience with using the URAL-4 computer as the basis of an automated control system and the changes in personnel structure such a control system requires. This article appeared in Issue No. 2 (75) for 1965.

2. Because the source of this report is extremely sensitive, this document should be handled on a strict need-to-know basis within recipient agencies. For ease of reference, reports from this publication have been assigned

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John N. McMahon

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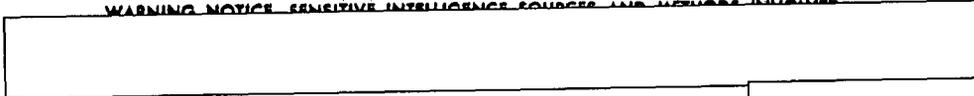
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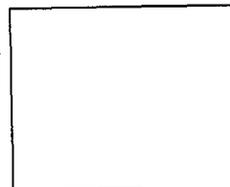
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Intelligence Information Special Report

Page 3 of 17 Pages

COUNTRY USSR



DATE OF INFO. Mid-1965

DATE 25 April 1978

SUBJECT

MILITARY THOUGHT (USSR): The Use of Automated and Mechanized Means in Organizing the Work of a Front Command Post

SOURCE Documentary

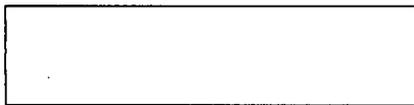
Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 2 (75) for 1965 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought'. The authors of this article are General-Leytenant A. Parshikov, General-Mayor Yu. Abramov, and Colonel V. Savelyev. In this article the authors share the experience gained from operational exercises and games in the Leningrad Military District at which questions of using automated and mechanized means of troop control were studied. They discuss specific applications of computers, keyboard and punchcard calculators, recording devices and photofacsimile and secure communications, and comment on the advantages and shortcomings of such equipment and the organization of personnel used in performing various data processing and transmission tasks. The latter part of the article is devoted to experience with using the URAL-4 computer as the basis of an automated control system and the changes in personnel structure such a control system requires.

End of Summary

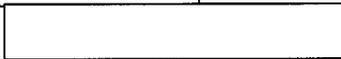
Comment:

The SECRET version of Military Thought was published three times annually and was distributed down to the level of division commander. It reportedly ceased publication at the end of 1970.



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The Use of Automated and Mechanized Means in Organizing
the Work of a Front Command Post

by

General-Leytenant A. PARSHIKOV
General-Mayor Yu. ABRAMOV
Colonel V. SAVELYEV

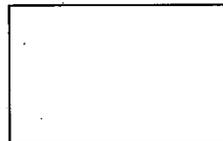
During recent years the Leningrad Military District has conducted a series of operational exercises and games, at which questions of using automated and mechanized means of troop control have been studied. As a result, a certain body of experience has been built up, particularly in the use of electronic computers, keyboard calculators, punchcard calculators, tape recorders, dictaphones, and duplicating equipment in organizing the work at a front command post.

In the present article we would like to share this experience and also express our views on the prospects for using automated and mechanized means and on the possible alteration, in connection with this, of the structure of front (military district) control organs.

* * * *

Electronic computers were used mainly in support of the operations directorate, the staff of the rocket troops and artillery, the directorate of the chief of the air defense troops, the chemical department, and also the staffs of the air and combined-arms armies, for solving the following most typical problems: determining the required number and yield of nuclear warheads and the distribution of fire tasks among the missile units (subunits); estimating the anticipated results of employing nuclear weapons; determining the radiation doses which personnel may receive; performing calculations for troop regrouping; estimating the combat capabilities of the grouping of SAM systems under different variants of structuring their battle formations; performing calculations for bombing with nuclear means; and others.

These machines were situated 100 to 700 kilometers from the front command post. The initial information and the computer results were transmitted over existing telegraph communications channels which were not





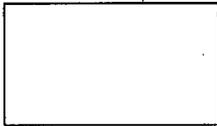
specially equipped to increase accuracy or speed. For this reason, information was transmitted several times, which placed an extra load on the communications channels and sharply increased the information flow time.

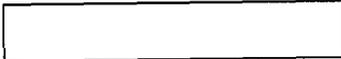
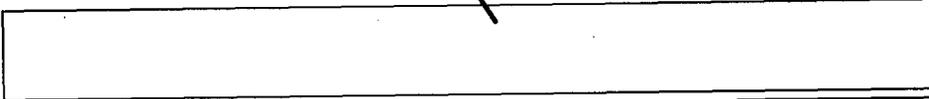
A comparatively large amount of time was also taken up with the preparation of initial information and the filling out of forms. This was due, first, to the lack of skills on the part of staff officers in solving operational-tactical problems by electronic computer and second, to the fact that the existing request and reply forms are not standardized, are unwieldy, and are very complicated, requiring careful training and systematic practice by the users for their completion.

For all of these reasons, the total time for solving problems by electronic computer was comparatively great -- from two to five hours. In this process, as statistical data show, about 50 percent of the total duration of the problem solving cycle went for processing the information and transmitting it over communications channels, 40 percent for preparing the initial data and filling out request and reply forms, and only about 10 percent for direct computer operation.

On the whole, experience in using the existing general-purpose electronic computers provides a basis for stating that in order to find new methods of troop control in the future and to train officers and generals in practical skills in working with automated means (until specialized field electronic computers are introduced into the troops), automated means must be used more widely in the operational training system, especially in operational staffs. Moreover, taking into account the complexity of organizing the use of these machines, their numerous technical shortcomings, and their immobility, it is necessary in the future to have electronic computers which have been improved and are smaller and more transportable. Also required is special equipment for increasing the accuracy of information transmission when using existing communications channels.

Those who process the problems must go over the list of operational-tactical problems together with staff officers. It must be taken into account here that the effectiveness of computers will be justified only in cases when the machine time comprises at least 20 to 30 percent of the total time of the problem solving cycle. The direction of this work should be centralized in a single organ, for example, in one of the scientific research institutes, with broad participation by officers from the staffs of the military districts. It may be desirable to prepare





and conduct a conference on this matter.

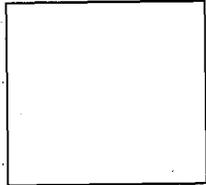
In order to reduce the time for preparing initial information and filling out request forms, simpler standardized versions of these forms are required.

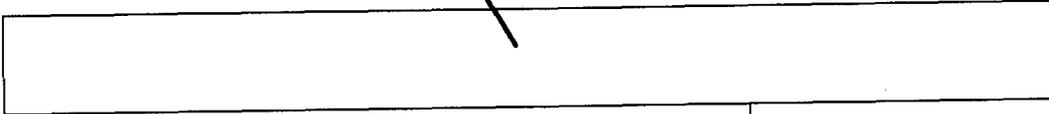
In those instances when the staff is located at a substantial distance from the electronic computer, it is advisable to transmit the machine results, which are received in graphic form, over phototelegraphic communications channels.

Keyboard calculators were used in the main directorates of the front to perform calculations connected with the preparation of initial data. Based on the experience of exercises, these machines may find the most effective application in determining the balance of forces and means, establishing the optimal times in which to achieve readiness of nuclear and chemical warheads, totalling up the numerical strength of front troops and the personnel losses, allocating artillery ammunition according to the tasks and formations in an operation, estimating the effectiveness of the grouping of surface-to-air missile units, and calculating the anticipated expenditure of surface-to-air guided missiles during an operation and determining the radiation dose received by personnel.

Punchcard calculators were used mainly by the intelligence directorate of the front in directing OSNAZ units. For this purpose a special system was worked out (a punch circuit) which made it possible to receive intelligence data and record them on punchcards. Having a large number of these recordings in convenient working form, it was possible to select the data needed at a certain moment by means of a sorting machine. Using this system, the time for selecting recorded intelligence data was reduced by a factor of four to five. Thus, for example, to determine the grouping of US strategic bombers at forward bases in Europe which were making flights as part of the operation RETALIATORY ACTIONS, up to three hours were required without the use of punchcard calculators. On a sorting machine, however, this task, with subsequent printout on a tabulator, was accomplished in 40 minutes.

It has been established through practice that on a T-5M tabulator we can solve problems making it possible to accelerate the process of data processing and preparation in order to organize radio and radiotechnical reconnaissance better and more quickly. Thus, in order to set up observation of American military satellites, it is necessary to know the time at which they cross the equator and their change in longitude with





each revolution. At present 1.5 to two hours are spent on calculating a 24-hour forecast for one satellite; but using a tabulator, the forecast for any satellite can be made in five to six minutes, i.e., 18 to 20 times faster.

It can thus be said that keyboard calculators and punchcard calculators can already today find wide application in all directorates (departments) of a military district (army) staff, and especially for carrying out tasks concerned with taking stock of materiel. In addition, keyboard calculators can be used successfully in large units and units.

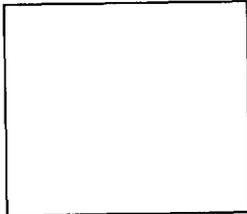
In addition, it should be noted that the available models of punchcard calculators require considerable improvement, which must proceed along the line of decreasing their size and weight and increasing their transportability and operating reliability.

By means of DNEPR and MAG tape recorders and N-180 dictaphones, the commander's decision was recorded on magnetic tape, which was then delivered to the troops by aircraft or by motor vehicle. This equipment also made it possible to listen to the commander's instructions in order to clarify questions connected with the practical work of front directorates and departments.

Duplicating equipment (staff printing equipment, typographic printing equipment, copying equipment, etc.) was used to duplicate maps, diagrams, and textual documents and for printing various forms and blanks. This equipment may be used all the way down to the large unit staff.

At the exercise RADIY, phototelegraphic communications were used to transmit graphic documents (maps, diagrams, etc.). Studies have shown that from the viewpoint of accuracy, this method will clearly be the most reliable means at present for transmitting computer results received in the form of tables and graphs [from?] such electronic computers as the URAL-4 (when they are a substantial distance away from military district directorates and departments). This form of communications can be widely used for transmitting individual elements of a situation from a tracing (the existing phototelegraphic equipment is limited as to the size blanks it can handle and does not provide for transmittal of large sections of the situation).

The VMPPEL phototelegraphic device showed good operating qualities. In our opinion, it can find wide application, especially at the army-front level.



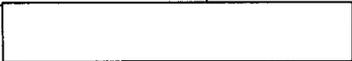
The automatic secure communications (ZAS) device for telephone and telegraph messages (T-216, T-204) substantially reduces the time for the passage of information from the originator to the addressee and is a great convenience in using communications means. Thus, for example, the transmittal time for a ZAS telegram is 1.5 to two times less than that for cryptograms and cipher messages.

The semiautomatic method of coding by means of coding equipment reduces coding time two to three times as compared with the manual (tabular) method. If coding equipment is integrated with certain communications means (within the system of the communications center), it is possible to substantially reduce the total time for transmittal of messages and to increase the role of certain types of communications (for example, morse radiotelegraph).

Experience from the exercises very convincingly demonstrates that in order to make successful use of automated means, there must be careful preliminary training of personnel of the military district directorates (departments), particularly in solving problems by electronic computer. In our military district this work was carried out in the following sequence.

The officers studied the problems which were submitted for solution by electronic computer at a given exercise (war game) in support of any given directorate (department). They familiarized themselves with the operational description of these tasks and the substance of the constant and variable information. The formulation of request and reply documents was worked out with them. Training problems in the practical solving of problems on machines were conducted with the officer-executors and with personnel of communications subunits allocated to service communications channels between the front command post and the computer centers -- practical problems in transmitting information by electronic computer. In addition, all generals and officers of directorates and departments were familiarized with the general characteristics, capabilities, and procedure regarding the use of electronic computers in solving problems submitted at the exercise. The electronic computers themselves, the equipment, and the communications channels were also prepared for operation.

Much attention was devoted to establishing a procedure for collecting information which had to be concentrated in any given directorate (department) in order to complete the request forms. In solving this problem we ran into a situation in which, because of an unclear situation, certain data necessary for solving a problem by electronic computer were



not received. In such instances it was necessary either to await receipt of the respective data or to determine them on the basis of the anticipated development of events. We consider that it is fully possible in many instances to fill in missing links in the chain of information on the basis of logical reasoning and comparisons, and this will be one of the areas of research of military cybernetics.

Training to operate other means did not cause great difficulties, and it amounted mainly to a brief study, by personnel of directorates (departments), of tactical-technical data and the capabilities of the equipment to be used, and also to practical sessions with the personnel operating the equipment directly.

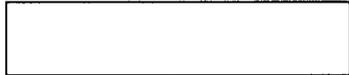
The final stage of the training was the conduct of an exercise by the staffs under field conditions using communications means, where problems were solved with the use of automated and mechanized means as applied to the actual situational conditions.

Coordination and supervision of the use of automated and mechanized means at the front command post were carried out by a specially established group of officers attached to the operations directorate. This group was made up of officers of that directorate, the radioelectronic warfare department, and the communications directorate, who, based on the nature of the duties they were to perform, were given more practice training than the others on these means. For example, according to experience from the war games RADY and FEVRAL (FEBRUARY), the group from the operations directorate included officers working on a plan for using missile/nuclear weapons; regrouping forces, conducting reconnaissance, and forecasting the radiation situation. The main duties of this group were to determine the problems which had to be solved for directorates and departments using automated means and to establish their order of priority for processing on the computer; to prepare the documents necessary for this action; to supervise the using of the means; and to collate the results.

The group was divided into two sections. One studied questions of using computers and the other studied questions of using keyboard calculators, punchcard calculators, and means of minor mechanization. Participating in the work of the first section, in addition to the assigned staff officers, were officer-specialists from the installations whose computers were being used in support of the military district.

As a working document, the group worked out a plan for using automated and mechanized means, indicating the list of problems to be solved for each



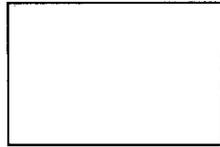


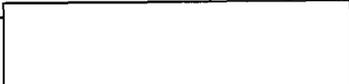
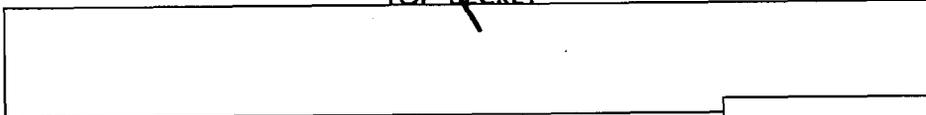
directorates, the respective executors, the time limits for completion, the means to be allocated, and other matters.

In each directorate, one or two officers were detailed to directly solve problems using electronic computers and to cooperate with the automation group, and the required number of personnel were also detailed for work using keyboard calculators and means of minor mechanization. In addition to the officers of the group, other officers also studied questions of using automated means, for example, officers of the operations directorate, in which phototelegraph communications, signal-coding equipment, and secure communications devices were installed for transmitting instructions and receiving reports from the troops.

The experience of exercises, as well as the continued adoption of automated and mechanized means into the troops in ever growing numbers and the establishment of computer centers and points in many military districts provide grounds for questioning whether it is necessary for the military district staff to include an organic group to organize the operation of these means and to carry out monitoring and assistance for the directorates (departments) and staffs in the course of working out (assimilating) the respective problems and getting the most out of available equipment.

The establishment of such a group will make it possible to make the most efficient use of automated and mechanized means and to provide qualified direction of their employment, i.e., to distribute them among the directorates (departments), formations, and large units of the military district, to plan for the solution of problems by electronic computer at the computer point, to select and prepare new problems to be solved, to organize the supply of spare parts for machines and their repair and routine maintenance, and also to train servicing personnel and officers to operate automated means and to draw general conclusions from their experience in using these means and flowcharting the functions of an automated system. Handling these tasks with forces from a non-organic group in each military district does not seem possible in view of the shortage of personnel and their insufficient level of training. In our view, the organic group must include a chief, an officer for computer use, an officer for the use of keyboard calculators, punchcard calculators, and means of minor mechanization, and an officer for transmittal means and information coding. The group must be directly subordinate to the military district (front) chief of staff and must be located at the command post near his place of work. A procedure for cooperation among the automation group and the directorates (departments), the computer center, and the computer point, is shown in the diagram.





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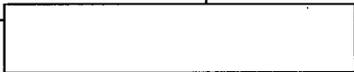
In addition to this, an automated control system is being set up in the Leningrad Military District using the URAL-4 electronic computer. This system, it appears to us, makes it possible to increase the working efficiency of the military district directorates in peacetime and with the beginning of combat actions. In particular, it is possible, using this system, to receive information on enemy nuclear strikes and on the meteorological situation in a considerable portion of the military district's territory and, after processing it in a short time by electronic computer, to assess the radiation situation and the effects of the enemy's employment of nuclear weapons. The system already makes it possible at this time to receive the necessary data and to solve problems regarding numerous questions of materiel-technical support, supply planning, troop transport, preparation of reports (requisitions), etc.

The base of the system is the information posts and centers set up in the staffs of units, large units, and formations. Information on the problems to be worked out and received for solution from these sources comes in to the electronic computer of the military district computer center, where it is processed and the results are sent out to the directorates (departments) concerned.

At the information posts initial data are prepared according to previously established forms (data cards) by officers of those services on whose behalf the problems are being solved. The data are then transmitted to the information centers of large units over appropriate communications channels in coded form. Here they are decoded, and the results are collated and transmitted to the information center of the formation, in coded form or over secure communications channels. After this the information goes to the military district computer center. For many tasks on which the data do not have to be collated in the large units and formations, the information is transmitted directly through the information centers to the computer center.

It must be noted that in order to fulfil its functions, each information source must be provided with the appropriate equipment. Thus, for example, at information posts there must be a coding machine, and at information centers -- STA-2M telegraph sets and coding machines. Overall direction of the indicated information sources is exercised by the chiefs of the respective staffs. This is made necessary by the fact that the information posts (centers) are an integral part of the communications centers, for whose operation the chief of staff is also responsible along





with the chief of communications. In addition, the chief of staff is the most competent person in all matters regarding the daily life and activity of the unit, large unit, and formation and is therefore able to organize the most proper and effective use of the posts (centers).

The direct supervision of information posts or centers is the responsibility of specially detailed persons who as a rule are operations officers. The main task of these officers is to organize the training of the personnel of the posts (centers) and to monitor the timeliness and correctness of the preparation and transmittal of information.

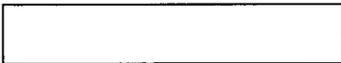
Under field conditions, the information sources retain their function, and their work with regard to the foregoing is set up with due consideration for the concept and nature of the exercise and the specific conditions of the situation. The information posts and centers are located at the command posts of units, large units, and armies, since they play the main role in troop control and have better communications means at their disposal than do the other control organs. This is what ensures the necessary stability in the operation of the entire system. As regards the front (military district), here direct supervision of the operation of the entire automated system is carried out by the automation group (at present non-organic).

We are convinced that as automated means are adopted, the T/O&E of control organs must be altered, and this will lead in turn to the reorganization of information posts and centers and to their taking root organically, so to speak, in the organizational structure of staffs.

At present many military districts have computer points equipped with keyboard calculators and punchcard calculators. Experience in using these points at exercises in the Leningrad Military District indicates the desirability of dividing them into two sections: for command posts and rear control posts. The section which is located at the command post must have keyboard calculators and punchcard calculators aboard specially equipped motor vehicles. Their work is directly supervised by the chief of the computer point, who in turn is subordinate to the chief of the automation group.

The availability in the troops of a substantial quantity of automated and mechanized means has necessitated an increase in the technical knowledge of officer personnel of the military district directorates (departments), the organization of continuous training of specialists, and an increase in engineer-technical personnel, for both the servicing and the



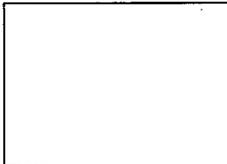


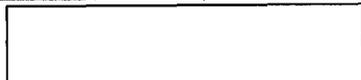
direct operation of these means. Those military districts, which already have organic specialists at computer centers (points) and can call in appropriate personnel from training institutions and other establishments, possess certain capabilities to organize training with their own forces. Basically, this training will amount to the instruction of officers involved in the use of automated means and the mastering, by certain categories of personnel, of specialties not requiring long and complicated training (operating the coding machine, transcribing information onto punch tape, etc.).

In the Leningrad Military District this training was conducted at officer courses, of which there have been several over recent years. The officers have obtained the necessary theoretical and practical knowledge and are able to prepare the description of tasks and the initial information, to process the machine results, and to assist the troops in using the respective means. Also, in the military district, large units, and formations, courses were held for personnel of communications centers, with instruction and practice on coding equipment. However, all of this has proved inadequate, and already today we are feeling the need to train programmers, technicians, and engineers for computer operation, technicians and mechanics for keyboard calculators and punchcard calculators, etc. It is obvious that considerably more attention must be given to training specialists and officers of directorates (departments). In our opinion, training must be organized primarily in the military districts, but for the most complex specialties, it should be centrally organized.

The supplying of control organs with automated means and the inclusion of computer centers (points) as an integral part of staffs place additional responsibility on many officials. The chief of staff of the military district, for example, must determine the procedure for using the computer center and point, i.e., he must establish which problems should be solved using automated means, within what time limits, and in support of which directorates (departments). He is also responsible for reviewing and approving the total list of problems which it is planned to solve. Through the automation group, he monitors the timely and high-quality performance of the work stipulated by the plan, etc.

The chiefs of the military district directorates and departments, in conformity with the plan for employing the means of the computer center and point, determine the procedure for preparing the data necessary for solving problems. They also establish the procedure for using the automated and mechanized means available in the directorates and departments. The main task of the communications directorates is to prepare communications





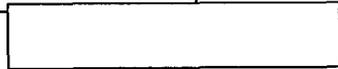
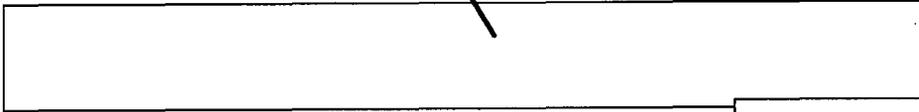
channels for the transmittal of information and also to train specialists capable of ensuring the timely transmittal of information with the required accuracy. It is the responsibility of the Eighth Department to supply the information sources on a timely basis with the keys for operating the coding machines or with the proper procedure tables (for units where there are no coding machines).

The main point at which automated means will be concentrated is the control post of the troop commander, with all of the elements of which it is composed. At this post will usually be located the chief of the rocket troops and artillery, the commander of the air army, and the chiefs of intelligence, of the air defense troops, and of the chemical troops, and others. This enables the commander to make fullest use of the capabilities of automated means for adopting a decision and assigning tasks to the troops within short time limits.

The use of automated and mechanized means inevitably brings with it an altering of the structure of the individual components of the control organs and directorates and departments of the military district (front) in general. The development of these changes will obviously be gradual, as the transition to an automated control system is made first at key levels and then at all levels. During this process we should anticipate a certain reduction of personnel in many directorates and staffs. It can already be stated that the use of automated means in military district directorates will make it possible to effect a certain reduction in the number of officers in the future. For example, by adopting automatic secure communications devices, it will be possible to reduce the numerical strength of the Eighth Department of the military district (front). It is also possible to reduce the complement of directorates and departments occupied with bookkeeping and calculating functions. This is fully confirmed by the operating experience of the military district computer point. Thus, for a statistical report on the numerical strength and composition of reserve officer personnel, the military district personnel department spent 576 man hours, but using the computer point only 140 hours were required. For checking the reports of district military committees on the use of their resources of reserve noncommissioned officers and soldiers, the organization and mobilization directorate required as much as 450 man hours, but using the computer center only 102 man hours were required, etc.



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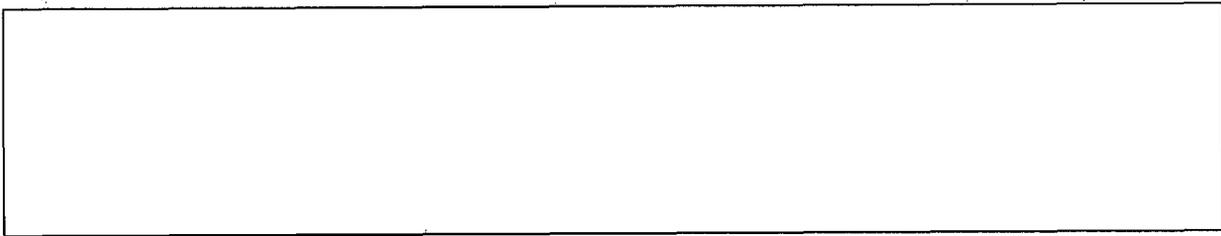


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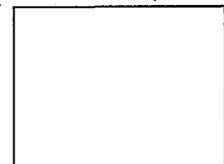
At the same time, in order to eliminate the discrepancy which will have formed between the growth in the technical equipping of the communications system and the quality of its direction and servicing, the need arises to reinforce the communications directorate with engineer-technical personnel.

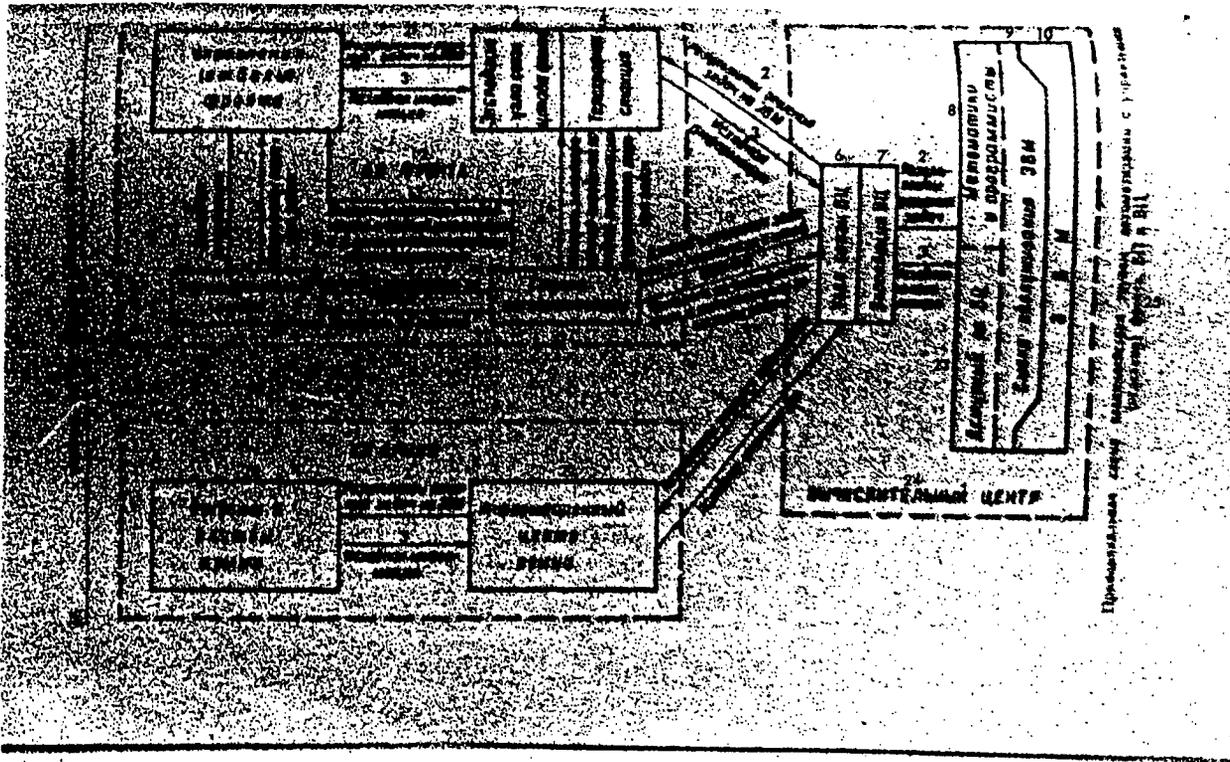
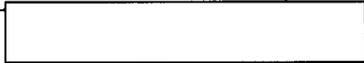
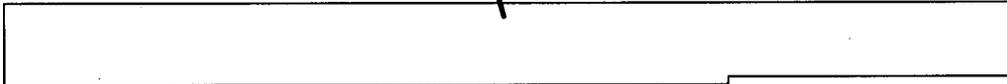
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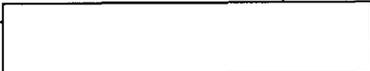
Some of the recommendations set forth in this article concerning the use of automated and mechanized means to increase the efficiency of troop control can certainly not claim to be final conclusions. The questions considered must be the subject of further research at all exercises and war games which are held.



~~TOP SECRET~~







LEGEND

1. Front directorates (departments)
2. Computer problem-solving results
3. Initial information
4. Message center of communications center of front staff
5. Telegraph post
6. Communications center of computer center
7. Message center of computer center
8. Mathematicians and programmers
9. Computer servicing staff
10. Computer
11. Computer point
12. Front command post
13. Rendering of assistance in preparing initial information and in using automated means
14. Report on completed tasks
15. Monitoring of work
16. Monitoring for timely transmittal of initial information and computer problem-solving results
17. Automation group
18. Report on completed tasks and on their transmittal to the front staff
19. Monitoring for timely and high-quality handling of tasks
20. Army departments and services
21. Army command post
22. Army information center
23. Computer center duty officer
24. Computer center
25. Schematic diagram of the cooperation among the automation group and the front directorates (departments), the computer point, and computer center

