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CENTRAL INTELLIGENCE AGENCY
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2 September 1975

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT   : MILITARY THOUGHT (USSR): The Status of Electronic
                  Computer Equipment and Ways to Increase the
                  Effectiveness of Its Use in the Work of
                  the Control Organs of the Armed Forces

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". This
article proceeds from the premise that the development of scientific troop
control methods is inconceivable without computers, and describes the three
stages in which computer equipment may be introduced into control work: the
installation of computers, keyboard and punchcard calculators; the
establishment of autonomous automated sectors; and the setting up of
integrated automated systems covering many control levels. The author
elaborates on these stages, defining the problems to be solved at each
stage and the customers for the computer output. This article appeared in
Issue No. 3 (91) for 1970.

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

William E. Nelson
Deputy Director for Operations

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MILITARY THOUGHT (USSR): The Status of Electronic Computer Equipment
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Use in the Work of the Control Organs of
the Armed Forces

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which
appeared in Issue No. 3 (91) for 1970 of the SECRET USSR Ministry of
Defense publication Collection of Articles of the Journal "Military
Thought". The author of this article is Marshal of the Soviet Union Matvey
Vasilyevich Zakharov. This article proceeds from the premise that the
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sectors; and the setting up of integrated automated systems covering many
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problems to be solved at each stage and the customers for the computer
output.

End of Summary

Comment:

Marshal Zakharov, the late Chief of the General Staff, contributed several
articles concerning military science and troop control to this publication.
He died 31 January 1972. 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.

The Status of Electronic Computer Equipment and Ways to Increase the Effectiveness of Its Use in the Work of the Control Organs of the Armed Forces
by
Marshal of the Soviet Union M. Zakharov

The Communist Party and its founder, V. I. Lenin, have always paid great attention to questions of the organization of labor and administrative activity. Vladimir Ilich demanded a thoughtful approach to the organization of control, the use of scientific achievements in production, the consideration of specific conditions, and the display of broad initiative by the workers. He pointed out that the higher the level of development of the economy, the more sensitive production becomes to any administrative and organizational defects. Lenin's approach to solving the problems of building socialism is the firm foundation of our Party's work.

The December Plenum of the Central Committee of the CPSU in 1969 particularly stressed the need for the further introduction of scientific methods of control and for the extensive employment of electronic computer equipment. Scientific methods of control are the most important instrument for increasing the rate of growth of our economy.

In a report at the December Plenum, General Secretary of the Central Committee of the CPSU, Comrade L. I. Brezhnev noted: "Control is turning into a science, and we must master this science as rapidly and as thoroughly as possible; it must be seriously studied even by those who occupy senior command positions in control... At the present time we attach great importance to accelerating the rate of development of control and information systems and electronic computer equipment. There is much to be done by our specialists: by technicians, mathematicians, engineers and other specialists involved in this field."

The fulfilment of Communist Party requirements is the priority task of the Armed Forces. The task is defined by the present level of development of the army and navy, by the great amount of equipment that has been given them, and by the conditions for waging a missile/nuclear war. Raising the level of scientific troop control by all possible means has now become a requirement of the times and one of the main problems being worked out by our military personnel.

The most important feature of modern methods of troop control is the extensive use of means of mechanization and automation, primarily computer equipment. They permit the ever-increasing flow of information needed to carry out control to be processed in the best possible manner. Herein lies the significance of the computers employed in the work of the various troop control organs.

This article will focus attention on the use of these means and on possible ways of increasing the effectiveness with which computer equipment and scientific methods of troop control are applied.

A singularly important problem today is the introduction of scientific control methods into the highest control organs of the Armed Forces: the General Staff, the main staffs of the branches of the Armed Forces, and the central and main directorates of the Ministry of Defense. These organs occupy key positions in the maintenance of our country's defense capability, and carry out the most important functions in the direct control of troops. Their daily activity must be in full accord with the current level of our means of armed combat and with methods for the combat employment of these means; it must also take into account the conditions of a complex international situation. At the present time the development and improvement of control methods are inconceivable without the introduction of computers into the work of staffs and directorates. In conjunction with communications means and automatic secure communications equipment, computers can ensure the fulfilment of the most labor-consuming control processes: the collection and processing of information; the preparation of a set of operational computations; and the reproduction and distribution of various combat documents to subordinate staffs. The problem of increasing the effectiveness of troop control is closely tied in with reducing the time needed for collecting and collating data on a situation and for making a decision.

The appearance of nuclear weapons and the broadened scope of modern operations have led to an increase in the overall number of measures used for troop control. At the same time, the role of the time factor in these processes has increased many times over. The necessity of making crucial decisions within very limited time periods is now becoming evident even in the higher control organs of the Armed Forces. The only way to overcome the discrepancy between the increasing flow of combat information necessary for decision-making and the reduced time available for its processing is to automate the processes of collection, collation, processing and output of information. This is possible only through the use of computers.

Machine processing of information increases the efficiency of document preparation, especially of those documents requiring the selection, organization and classification of large amounts of data in a prescribed order. Tying in computers with communications channels allows input data for machine processing to be received directly from subordinate troops. Many modern information-computational systems are built on this principle. Combining several computers into a single complex greatly enhances the capabilities of technical means to process information. However, at the present time the variety of computers in use makes it difficult to set up a direct exchange of information among them. Even existing second-generation computers (using transistorized components) still do not completely satisfy the needs of the army and navy.

The next five-year plan for our industry calls for the production of a series of third-generation computers built on new organizational and technological principles. Their introduction will ensure the programming compatibility of computers of different manufacture. All of this establishes the prerequisites for the widespread use of computer equipment in the Armed Forces.

The employment of computers for troop control purposes requires the development and mastery of modern mathematical methods. The development of applied mathematics for use in solving military problems has brought about a sharp growth in the role of quantitative methods. A new branch of science has appeared -- the theory of operations research. Methods for operations research make use of the theories of probability, games, and queues, as well as mathematical programming, modeling, and statistics.

Many recommendations derived from the theory of operations research are useful in military science and practice; some have been adopted and are widely used in staff work (such as evaluating the effectiveness of missile/nuclear strikes, forecasting radiation conditions, and others). The application of mathematical methods makes it possible to combine intuitive evaluations with scientifically based recommendations.

Thus, in our time the system of control has acquired new means and methods which, as they develop, will have an increasingly vital influence on the nature of the work of staffs and institutions. It is only necessary to select the correct means of automation and then to master the methods for their use. This method opens broad possibilities for improving troop control and overcoming tendencies toward the continuous proliferation of control organs.

In recent years a number of research and development projects have been carried out which produced specific recommendations for the practical application of computers and the mastery of computer equipment. Success has been achieved in solving problems connected with planning and the combat employment of strategic forces and means, the repulsion of an enemy aerospace attack, and with the organizational formation and mobilization expansion of troops.

Work conducted in the field of the application of computer equipment and other means of automation is directed primarily toward raising the level of the combat readiness of the Armed Forces and toward ensuring operational control over them in peacetime as well as in wartime. The experience gained from the introduction of mathematical methods and computer equipment into the work of control organs has made it possible to raise planning to a higher level, to shorten the time needed for the completion of certain work, to reduce the labor involved, and to improve the quality of the decisions made.

In the General Staff the use of computers to make calculations makes it possible to obtain recommendations for the employment of branches of the Armed Forces in modern operations; for the allocation of targets for destruction to strategic nuclear forces in light of possible enemy countermeasures; for the evaluation of the effectiveness of air defense groupings; for the determination of the results of massed nuclear strikes; for the planning and carrying out of troop regroupings; and for many other problems.

In addition to improving the quality and reducing the time needed to complete the work, computer calculations also have a significant economic impact on the use of financial resources. For instance, the use of computers to solve problems resulted in a savings of 700,000 rubles in one year for one of the directorates of the General Staff.

However, along with the positive experience of introducing computers into the organization of this work, there also are significant shortcomings.

The control organs have not yet achieved the necessary degree of continuous supervision of the research institutions which carry out work on their behalf. The assignment of tasks to scientific organizations is often done imprecisely, with the result that time, forces and means are expended unproductively and the quality of scientific research suffers. Besides working out methods for solving problems with computers, the personnel of

research institutions often make applied calculations; this diverts scientific personnel from the solution of urgent problems.

Long periods of time are spent by scientific organizations in developing new problems for solution by computers. Considerable time elapses from the moment that a task is assigned until it is finally carried out in staffs and institutions. For this reason some problems become outdated while being developed. Control organs pay little attention to the progress of the research until they receive the completed programs. As a result, it becomes necessary to modify completed programs or to rework them.

As the volume of computer work increases from year to year, the research institutes cannot develop new problems on a timely basis and also update those already on hand. For this reason the time has come for control organs to have computer centers (points) to make applied calculations and necessary changes in the procedure for problems. In this case, after completing scientific topics, the institutes will be able to forward developed algorithms and programs to the computer centers (points). This kind of organization of computer work is highly responsive to the current demands of control organs.

Accumulated experience shows that the most important problems which sharply increase the effectiveness of troop control must be developed for the control organs. In addition, we should concentrate our efforts on developing and introducing into the computers those problems which cannot be solved manually. Of importance today is the quality, not the quantity, of the problems solved.

Among the diverse activities of control organs, the collection of situation data occupies a special place. However, up to now information handling processes have been developed on a limited scale, which appreciably lowers the effectiveness of the use of computer equipment.

We must also turn our attention to the existing procedure for document circulation. The use of computers requires a strict system for transmitting information, and the standardization of combat documents. Automation of the processes of information collection and processing is based on the principle of the formalization of reporting documents. We are faced with the urgent problem of reducing the number of documents circulating in the control system, and also of changing staff operating methods. We cannot allow new means, including computer equipment, to be adapted to the old operating methods of the control organs.

How must we go about using computers in staffs and institutions? What are the immediate prospects for the use of computers?

World-wide experience shows that the process of the introduction of computer equipment into the work of control organs usually can be divided into the three following stages.

The first stage -- the installation in control organs of computers, keyboard calculators and punchcard calculators, and their autonomous use. The best conditions for this are created when the control organs have their own computer resources. However, the use of computer equipment belonging to scientific organizations is also possible.

The General Staff, certain main staffs of the branches of the Armed Forces, and the central and main directorates of the Ministry of Defense are presently completing the first stage in the application of computer equipment. Work with computers is being performed directly in sufficient volume by officers of directorates without bringing in any specialists. The officers of organs of these directorates can prepare input data themselves, analyze the results of the calculations obtained, and apply them to work. The solution of problems by the computers of staffs and institutions to a significant extent favors an improvement in the level of the work of control organs.

During the first stage each control organ has had the opportunity to refine its lists of computational and information handling problems and the methods of solving them; to select the appropriate computer equipment; to evaluate its effectiveness; and to scientifically interpret the experience gained in using computers and mathematical methods in staffs and institutions. Upon completing this stage, the chiefs of staffs and institutions should give particular attention to organizational matters, on which success depends to a considerable degree.

Although the development of algorithms and programs is handled by specialists in mathematics, it should be borne in mind that effective solutions to problems are achieved through the joint efforts of staff officers and those developing the problems. The reason for this is that the officers are well acquainted with the nature of troop control processes and the sphere to which the problems apply, while the mathematicians are highly qualified specialists in the use of computer equipment and the preparation of programs.

Other factors entering into the organization of work for the use of computer means in the first stage are: determination of the procedure for the preparation by staffs of input data for the solution of problems; the carrying out of measures for protecting military and state secrets; and the analysis of the results of solutions to the problems, and their applied use.

Because the processes of troop control are inseparable from one another, it is necessary to solve several interrelated problems. For this reason more attention must be devoted to the development of integrated problems.

Problems regarding the practical operation of control organs are integrated on the basis of the need to support the most important troop control processes. For example, a group of problems on planning the combat employment of strategic forces combined a total of some 200,000 commands into a single complex.

At the present time a transition is taking place from the experimental solution of individual problems to their mass introduction into the everyday activity of control organs. Only 27 central scientific research institutes of the Ministry of Defense, working on behalf of directorates of the General Staff, are developing about 300 problems for solution by computers. These institutes are very diverse in nature; many are assigned to solve problems for just one specific control organ and, for all practical purposes, are autonomous.

This group includes the majority of the computational problems solved in the first stage. The basic characteristic of these problems is the need for preliminary collection and preparation of input data by conventional methods and means now in existence. Only the computing process itself is automated at this point. This is explained by the specific character of the first stage in the introduction of computers into troop control organs: an information handling system has not yet been established, but computer equipment already occupies a firm place in staffs and institutions.

The selection of computational problems for development was based on the urgent requirements of control organs regarding troop control. Priority was given to problems which appreciably enhance the effectiveness of control of the Armed Forces. Among these problems are those connected with expediting the process of the evaluation of a situation by the Supreme High Command, the General Staff, the commanders-in-chief and main staffs of the branches of the Armed Forces, the troop commanders and staffs of

operational formations, and the chiefs of the branch arms and special troops. Solving these problems with the aid of computers will speed up calculations of the number of forces and means of the enemy and our own troops which are operating in a certain strategic area or on an axis (in a zone). This also will make it possible to receive information on many specific conditions, for example: how many missile launchers, tanks, guns, etc. the enemy has in a given area; how many of these means have special ammunition; how many are transportable by air; etc. It is also possible to expedite the receipt of information when making calculations on the engineer preparation of a theater of military operations, on the economic conditions of specific areas of combat actions, etc.

The effectiveness of control is significantly increased when computers are used to solve problems concerning: the determination of the balance of forces of the two sides in a theater of military operations and on operational axes; the calculation of forces needed for fulfilling planned tasks; the formation of troop groupings; the support of operations; etc.

At the same time that problems of this nature are being developed, a large group of problems dealing with ensuring an increase in the effectiveness of the employment of modern means of warfare is being prepared for solution by computers. Among these are problems of optimizing target allocation; calculations for achieving the greatest effective use of fire means; calculations for neutralizing enemy control systems and means in support of our strikes; and others.

The greatest portion of the problems being developed for solution by computers concern the planning and comprehensive support of modern operations. Of appreciable importance among these are problems of planning the combat employment of strategic forces, strategic operations in theaters of military operations, and the mobilization expansion of the Armed Forces, as well as problems concerning the preparation of theaters of military operations, etc.

Parallel with the preparation of computational problems, work is proceeding on uncovering and describing information handling problems. This is done basically to ensure the automation of the collection, processing, storage and output of necessary information to responsible individuals in control organs. These problems are being developed in combination with a simultaneous analysis of the unified process of data collection and processing within the entire control system, beginning with the tactical level and ending with the General Headquarters of the Supreme High Command. The principal objective in developing these problems is to sharply reduce

the time required to collect and process information, and to greatly
increase the effectiveness of troop control.

The complex and labor-consuming nature of the processes for developing
information handling problems and the extended periods of time required to
establish automated systems for solving them make it necessary to
concentrate forces and means on the automation of the most important,
particularly urgent information handling processes in the existing troop
control system. These include processes connected with the transmission
within short time periods of the most important signals and commands,
confirmations of the receipt of a task, reports on its fulfilment, etc.
Short reports on the combat readiness and combat effectiveness of troops,
submitted in the same format from several combat units and large units, are
already being processed on the computers of staffs and are expediting the
preparation of a number of documents.

The combination of automation of the data collection process with
automation of the calculations made on the basis of these data constitutes
the basis for the establishment of future automated control systems. Thus,
the development of problems of this nature must proceed on a wide scale
with continuous coordination, as appropriate.

The joint activity of scientists and practitioners in solving problems
with computers lays the foundations for new methods of troop control based
on more modern high-speed equipment and the latest achievements of applied
mathematics.

At the present time a group of problems is being developed for the
General Staff, the main staffs of the branches of the Armed Forces, and
several main and central directorates. The preparation of a group of
problems for the staffs of military districts, groups of forces and fleets
has been organized. Work is in progress for the exchange of algorithms and
programs among the computer points (centers) of these control organs; this
ensures the use of a common procedure and the acceleration of the
introduction of the problems into the computers.

The first stage in the introduction of computers into applied use by
the organs of the directorates is not without substantial shortcomings. In
particular, the solution of individual problems by computers was automated
without analyzing the whole process of information routing. The problem of
updating huge amounts of information in autonomous computers remains
unsolved. The pace at which procedures are developed for problems has been
too slow, and the effectiveness of the use of computers has been less than

desired. In sum, the quality of computer work in the Armed Forces continues to lag behind the requirements of troop control organs.

The shortcomings noted above are most apparent in the work of the higher control levels since the volume of information being processed there is extraordinarily great. For example, in calculations for planning a strategic operation in a theater of military operations, several thousand items, each of which is characterized by eight to ten parameters (location, condition, type of actions, etc.) must be considered, while the calculation of the mobilization needs of the Armed Forces involves tens of millions of item designations.

The second stage in the introduction of computer equipment includes the establishment of autonomous automated sectors. This requires the development of sets of programs which assure the automation of the most important operating processes of several control organs. The main efforts in this stage must be concentrated on setting up an information handling process and on combining a group of computers, means of peripheral input of data, and communications channels.

The storage and updating of large amounts of information in the information handling process must be accomplished with a sharp reduction in the manual input of data. Methods for the automatic output of prepared documents will be developed on the basis of information handling problems. From the input information stored in the computer it is possible to effect the output of necessary reports to the working positions of responsible individuals by remote control.

The integrated use of computer means and communications means will allow us to take another stride in the second stage toward increasing the effectiveness of troop control. It will become possible to solve several operational problems simultaneously from the same body of information. In this stage it is possible to use more powerful computers with sufficient software and more complicated sets of programs.

The basic principle of giving priority to automating the most important control processes remains valid in the second stage. Automation of these processes must be carried out in accord with a definite program, so that the effectiveness of troop control will gradually increase as the technical means and the number of problems being solved by computers increase. In some cases the use of computers will increase the information gathering capabilities of the command systems for combat control which were established in the first stage. For instance, in the control system for

the rocket forces, a computer complex in combination with the SIGNAL automatic control system is already assuring the achievement of this goal to a certain extent. The computer complex solves problems concerning the determination of the combat capabilities of the rocket forces; the evaluation of progress in the fulfilment of combat tasks by them; the preparation of data for making decisions on the destruction of newly detected enemy targets; the replanning of missile/nuclear strikes based on the situation which has developed; etc. In the Leningrad Military District an information collection and processing system based on general-purpose computers is being used successfully.

Further accumulation of experience in the operation of individual automated levels and sectors should open the way toward a redistribution of the functions of responsible individuals in control organs and toward a constructive change in troop control methods themselves.

The third stage of automation includes the setting up of integrated automated information-computational systems which cover many control levels. The development of a constantly functioning set of programs and large amounts of servicing information is an important step toward the achievement of this goal.

The first part of such a set of programs will permit: the storage and updating of large amounts of information in computers using communications channels and the equipment on hand; the preparation of information reports for various purposes on previously developed forms, including automatic output on display and printer equipment; the preparation of large amounts of input data for the solution of computational problems; the output of urgent and non-scheduled reports; and, upon the request of the operators, the representation of the situation within specified strategic areas on screens. In doing this, all types of work can be carried out in combination, i.e., simultaneously. In this system the content and form of combat documents may be changed in accordance with the needs of control organs.

The second part of the set of programs ensures the solution of computational problems, the composition and number of which change depending on operational needs. The first part of the programs remains unchanged.

All basic parts of this information-computational system have been verified experimentally on a special computer; this makes it possible to hope for the practical implementation of this system. The computer centers

of large staffs are preparing for the implementation of an information-computational system in the coming years.

Thus, the third stage in the introduction of computer equipment is based on the further intensification and expansion of the processes of automation of troop control by combining individual automated systems and by further improving software. It is assumed that in this stage the reliability of operation of data input means and the dependability of equipment for security of the information will increase; that high-quality communications channels will be set up; and that new technical methods will be introduced to increase the reliability of information transmission.

As we can see, to organize control scientifically and to improve troop control methods, we must make wide use of computer equipment, and we must develop and master methods for using it in staffs and institutions. This is a relatively new and quite complex subject which requires deep specialized knowledge on the part of our personnel. More attention must therefore be given to the study of methods for applying computer equipment to troop control.

Accelerating the automation of troop control processes also depends to a large degree on the timely processing and adaptation of combat documentation for direct input of the data into computers. The application of machine methods of information processing can sharply increase the effectiveness of control only when we succeed in achieving the maximum retrenchment and orderliness of the document circulation system.

We must stress particularly that specific guidance of this work by chiefs of staffs and institutions is necessary if we are to make purposeful use of computer means. But we must not forget that the introduction of computers into the work of control organs does not replace creative activity by the command and staffs. On the contrary, the use of computer equipment and other new means of control opens broad possibilities for further improving the art of troop control.

By expanding the sphere of the use of computers in the army and navy we will successfully satisfy the requirements of the Communist Party and the Soviet Government for improving methods of scientific troop control and for raising the level of combat readiness of the Armed Forces of our country.